

SIEMENS

SIMATIC

Distributed I/O System ET 200S

Manual

Terminal modules

1

Power modules

2

Digital electronic modules

3

Analog electronics modules

4

4 IQ-SENSE
(6ES7138-4GA00-0AB0)

5

Potential distributor module

6

RESERVE modules

7

Important!

Please see Product Information at the end of the manual



The following supplement is part of this documentation:

| No. | Product Information | Drawing number | Edition |
|-----|--|----------------|---------|
| 1 | General corrections; Analog Electronic Modules 2 AI U HS, 2 AI/2/4 WIRE HF, 2 AO U HF | A5E00743001-02 | 12/2006 |
| 2 | Elektronic module 8DI / 8DO (6ES7131-4BF00-0AA0 / 6ES7132-4BF00-0AA0) | A5E00847859-01 | 09/2006 |
| 3 | Suppliment to the technical specifications PM-E DC 24-48V/AC24..230V (6ES7138-4CB11-0AB0) | A5E01040431-01 | 01/2007 |

12/2005

A5E00514527-03

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.



Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.



Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.



Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:



Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Terminal modules

Terminal modules implement the electrical and mechanical connection of the I/O modules with the interface module and the terminating module.

- The inserted I/O module determines the signals to terminals 1 to 16, A3, A4, A7, A8, A11, A12, A15, A16.
- Depending on the selected terminal module, only specific terminals are available.

Select the required terminal module based on the potentials required by your application. For more information on the signal assignment see the *ET 200S Distributed I/O System* manual in the description of the specific I/O module.

An AUX(iliary) bus AUX1 is integrated into the terminal modules. Any desired potential (up to 230 VAC) can be applied there. You can set the AUX(iliary) bus individually:

- As a protective conductor bar
- For additionally required voltage

1.1 Terminal module TM-P15S23-A1, TM-P15C23-A1 and TM-P15N23-A1 (6ES7193-4CCx0-0AA0)

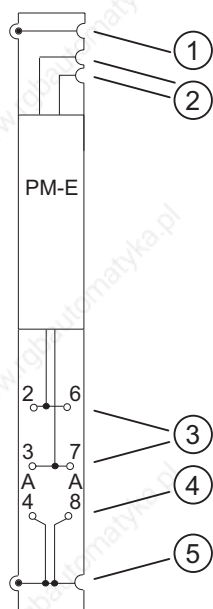
Properties

- Terminal module for power modules
- Infeed for a new potential group up to the next TM-P terminal module
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The signal assignment of the AUX1 bus is specified by the feed to the power module of this potential group.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- Access to the AUX1 potential through terminals A4 and A8

1.1 Terminal module TM-P15S23-A1, TM-P15C23-A1 and TM-P15N23-A1 (6ES7193-4CCx0-0AA0)

Block diagram

Block diagram of the TM-P15S23-A1, TM-P15C23-A1, and TM-P15N23-A1 terminal modules



- (1) Backplane bus
- (2) Infeed of the power buses to the electronic modules
- (3) Terminals with connection to the power module
- (4) Use of terminals A4 and A8 as protective conductor terminals or potential terminals of any kind
- (5) Infeed of the AUX1 bus by means of terminals A4 and A8

TM-P15x23-A1 Technical Specifications (6ES7193-4CCx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|---------------|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 × 132 × 43 |
| • Fast Connect | 15 × 162 × 43 |
| Weight | Approx. 65 g |

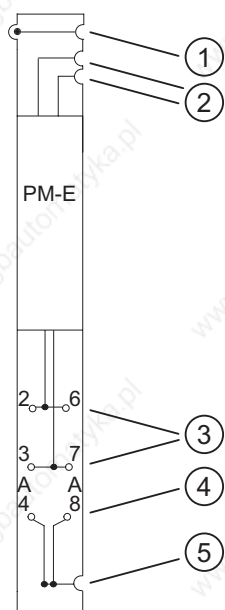
1.2 Terminal modules TM-P15S23-A0, TM-P15C23-A0 and TM-P15N23-A0 (6ES7193-4CDx0-0AA0)

Properties

- Terminal module for power modules
- Infeed for a new potential group up to the next TM-P terminal module
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The signal assignment of the AUX1 bus is specified by the feed to the power module of this potential group.
- Interrupted AUX1 bus without electrical connection to the next potential group to the left
- Access to the AUX1 potential through terminals A4 and A8

Block diagram

Block diagram for the TM-P15S23-A0, TM-P15C23-A0, and TM-P15N23-A0 terminal modules



- (1) Backplane bus
- (2) Infeed of the power buses to the electronic modules
- (3) Terminals with connection to the power module
- (4) Use of terminals A4 and A8 as protective conductor terminals or potential terminals of any kind
- (5) Infeed of the AUX1 bus by means of terminals A4 and A8

TM-P15x23-A0 Technical Specifications (6ES7193-4CDx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|---------------|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 × 132 × 43 |
| • Fast Connect | 15 × 162 × 43 |
| Weight | Approx. 65 g |

1.3 TM-P15S22-01, TM-P15C22-01 and TM-P15N22-01 terminal modules (6ES7193-4CEX0-0AA0)

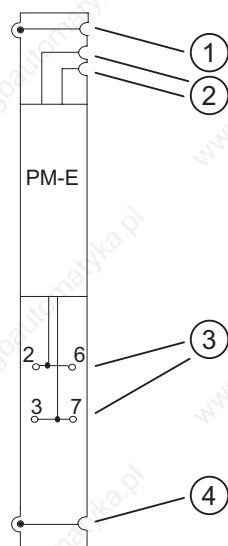
Properties

- Terminal module for power modules
- Infeed for a new potential group up to the next TM-P terminal module
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The signal assignment of the AUX1 bus is specified by the feed to the power module of this potential group.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- No access to the AUX1 potential through terminals

1.3 TM-P15S22-01, TM-P15C22-01 and TM-P15N22-01 terminal modules (6ES7193-4CEX0-0AA0)

Block diagram

Block diagram for the TM-P15S22-01, TM-P15C22-01, and TM-P15N22-01 terminal modules



- (1) Backplane bus
- (2) Infeed of the power buses to the electronic modules
- (3) Terminals with connection to the power module
- (4) Uninterrupted AUX1 bus without a connection to the terminals

TM-P15x22-01 Technical Specifications (6ES7193-4CEX0-0AA0)

| Dimensions and Weight | |
|-------------------------------|-----------------|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 x 119.5 x 43 |
| • Fast Connect | 15 x 142 x 43 |
| Weight | Approx. 55 g |

1.4 TM-P30S44-A0 and TM-P30C44-A0 terminal modules (6ES7193-4CKx0-0AA0)

Properties

- Terminal module for fail-safe PM-E F 24 VDC PROFIsafe power modules
- Infeed for a new potential group up to the next TM-P terminal module
- available in two variants: screw terminal, spring terminal
- Wiring of the fail-safe digital outputs of the PM-E F 24 VDC PROFIsafe
- The signal assignment of the AUX1 bus is specified by the feed to the power module of this potential group.
- Interrupted AUX1 bus without electrical connection to the next potential group to the left
- Access to the AUX1 potential through terminals A4 and A8



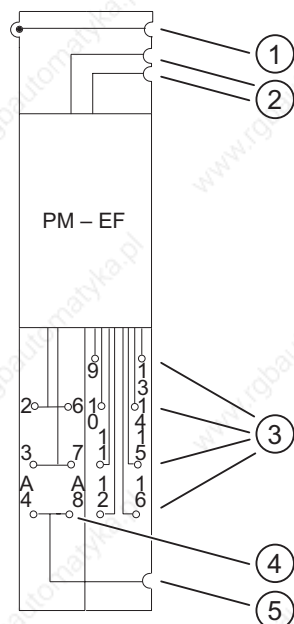
Caution

If high currents occur at DO 2 P and DO 2 M, you must wire terminals 11 and 15 (DO 2 P) and 12 and 16 (DO 2 M) in parallel. Otherwise, the temperature of the terminals cannot be prevented from rising due to the current load.

1.4 TM-P30S44-A0 and TM-P30C44-A0 terminal modules (6ES7193-4CKx0-0AA0)

Block diagram

Block diagram of the TM-P30S44-A0 and TM-P30C44-A0 terminal module



- (1) Backplane bus
- (2) Infeed of the power buses to the electronic modules
- (3) Terminals with connection to the power module
- (4) Use of terminals A4 and A8 as protective conductor terminals or potential terminals of any kind
- (5) Infeed of the AUX1 bus by means of terminals A4 and A8

TM-P30x44-A0 Technical Specifications (6ES7193-4CKx0-0AA0)

| Dimensions and Weight | |
|---------------------------|--|
| Dimensions W × H × D (mm) | 30 x 132 x 43 |
| Weight | Approx. 116 g (TM-P30S44-A0) Approx. 100 g (TM-P30C44-A0) |

Description of the PM-E F 24 VDC PROFIsafe power module

You can find a description of the PM-E F 24 VDC PROFIsafe power module that you can use with the above terminal modules in the *ET 200S Distributed I/O System, Fail-Safe Modules* manual.

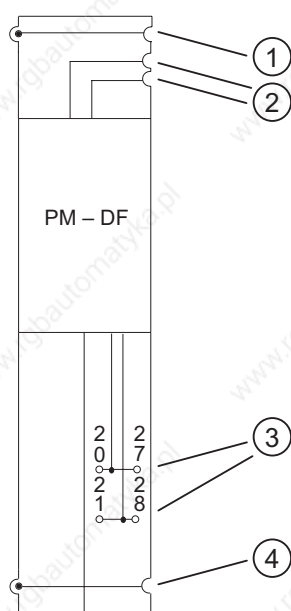
1.5 TM-PF30S47-F1 terminal module for PM-D F DC24V PROFIsafe (3RK1903-3AA00)

Properties

- Terminal module for fail-safe PM-D F 24 VDC PROFIsafe power modules
- Infeed for a new potential group up to the next TM-P terminal module
- Available with screw terminal
- The signal assignment of the AUX1 bus is specified by the feed to the power module of this potential group.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- No access to the AUX1 potential through terminals

Block diagram

Block diagram of the TM-PF30S47-F1 terminal module



- (1) Backplane bus
- (2) Infeed of the power buses to the electronic modules
- (3) Terminals with connection to the power module
- (4) Uninterrupted AUX1 bus without a connection to the terminals

1.6 TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 universal terminal modules (6ES7193-4CAx0-0AA0)**TM-PF30S47-F1 Technical Specifications (3RK1903-3AA00)**

| Dimensions and Weight | |
|---------------------------|------------------|
| Dimensions W × H × D (mm) | 30 × 196.5 × 102 |
| Weight | Approx. 300 g |

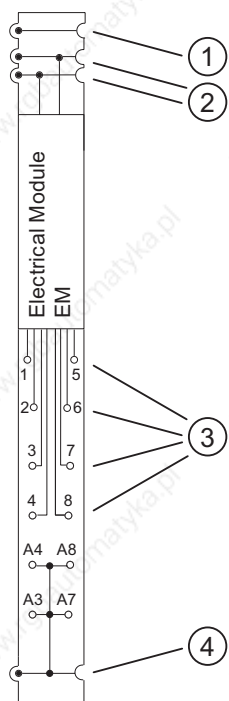
1.6 TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 universal terminal modules (6ES7193-4CAx0-0AA0)**Properties**

- Universal terminal module for all 15 mm wide electronic modules
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The electronic module determines the assignment to terminals 1 to 8.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- Access to the AUX1 potential through terminals A4, A8 and A3, A7

1.6 TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1 universal terminal modules (6ES7193-4CAx0-0AA0)

Block diagram

Block diagram for the TM-E15S26-A1, TM-E15C26-A1, and TM-E15N26-A1 terminal modules



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Uninterrupted AUX1 bus with connection to terminals A4, A8 and A3, A7

TM-P15x26-A1 Technical Specifications (6ES7193-4CAx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|---|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 × 157 × 43 |
| • Fast Connect | 15 × 202 × 43 |
| Weight | Approx. 70 g (TM-E15C26-A1) Approx. 83 g (TM-E15S26-A1) Approx. 95 g (TM-E15N26-A1) |

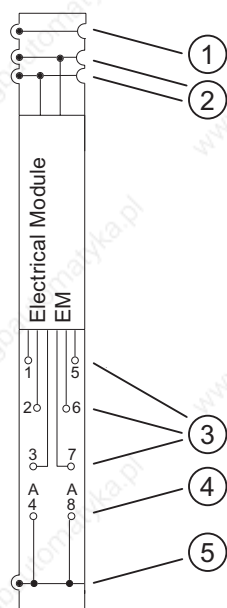
1.7 Terminal module TM-E15S24-A1, TM-E15C24-A1 and TM-E15N24-A1 (6ES7193-4CAx0-0AA0)

Properties

- Terminal module for 15 mm wide electronic modules
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The electronic module determines the signal assignment at terminals 1 to 3 and 5 to 7.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- Access to the AUX1 potential through terminals A4 and A8

Block diagram

Block diagram for the TM-E15S24-A1, TM-E15C24-A1, and TM-E15N24-A1 terminal modules



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Use of terminals 4 and 8 as protective conductor terminals or potential terminals of any kind
- (5) Uninterrupted AUX1 bus with connection to terminals A4 and A8

TM-E15x24-A1 technical specifications (6ES7193-4CAx0-0AA0)

Terminal modules

1.8 TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01 terminal modules (6ES7193-4CBx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|--|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 × 132 × 43 |
| • Fast Connect | 15 × 162 × 43 |
| Weight | Approx. 65 g (TM-E15S24-A1 and TM-E15C24-A1) Approx. 72 g(TM-E15N24-A1) |

1.8 TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01 terminal modules (6ES7193-4CBx0-0AA0)

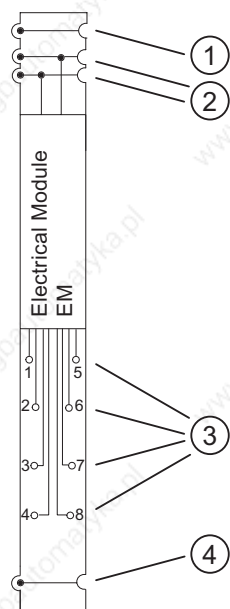
Properties

- Terminal module for 15 mm-wide electronic modules
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The electronic module determines the assignment to terminals 1 to 8.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- No access to the AUX1 potential through terminals

1.8 TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01 terminal modules (6ES7193-4CBx0-0AA0)

Block diagram

Block diagram for the TM-E15S24-01, TM-E15C24-01, and TM-E15N24-01 terminal modules



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Uninterrupted AUX1 bus without a connection to the terminals

TM-E15x24-01 Technical Specifications (6ES7193-4CBx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|---|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 × 132 × 43 |
| • Fast Connect | 15 × 162 × 43 |
| Weight | Approx. 65 g (TM-E15S24-01 and TM-E15C24-01) Approx. 72 g (TM-E15N24-01) |

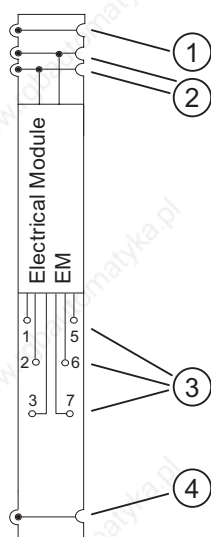
1.9 TM-E15S23-01, TM-E15C23-01 and TM-E15N23-01 terminal modules (6ES7193-4CBx0-0AA0)

Properties

- Terminal module for 15 mm wide electronic modules
- Available in two variants: screw terminal, spring terminal, "fast connect" quick connection method without stripping
- The electronic module determines the signal assignment at terminals 1 to 3 and 5 to 7.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- No access to the AUX1 potential through terminals

Block diagram

Block diagram for the TM-E15S23-01, TM-E15C23-01, and TM-E15N23-01 terminal modules



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Uninterrupted AUX1 bus without a connection to the terminals

TM-E15x23-01 Technical Specifications (6ES7193-4CBx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|---|
| Dimensions W × H × D (mm) | |
| • Screw-type/spring terminals | 15 × 120 × 43 |
| • Fast Connect | 15 × 142 × 43 |
| Weight | Approx. 55 g (TM-E15S23-01 and TM-E15C23-01) Approx. 60 g (TM-E15N23-01) |

1.10 Terminal module TM-E15S24-AT and TM-E15C24-AT (6ES7193-4CLx0-0AA0)**Properties**

- Terminal module for the 15 mm wide 2AI TC HF terminal module

**Caution**

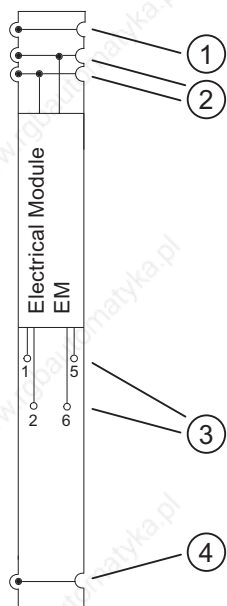
You can only insert the 2AI TC HF electronic module into the TM-E15S24-AT/TM-E15C24-AT terminal module. Inserting another electronic module can result in the destruction of the internal reference junction of the terminal module.

- The terminal module has an internal reference junction for temperature compensation. Temperature compensation is thus possible directly at the reference junction of the thermocouples.
- available in two variants: screw terminal, spring terminal
- The electronic module determines the signal assignment at terminals 1, 2 and 5, 6.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- No access to the AUX1 potential through terminals

1.10 Terminal module TM-E15S24-AT and TM-E15C24-AT (6ES7193-4CLx0-0AA0)

Block diagram

Block diagram of the TM-E15S24-AT and TM-P15C24-AT terminal module



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Uninterrupted AUX1 bus without a connection to the terminals

TM-E15x24-AT Technical Specifications (6ES7193-4CLx0-0AA0)

| Dimensions and Weight | |
|---------------------------|---------------|
| Dimensions W × H × D (mm) | 15 × 132 × 43 |
| Weight | Approx. 55 g |

See also

2AI RTD High Feature analog electronic module (6ES7134-4NB01-0AB0) (Page 4-93)

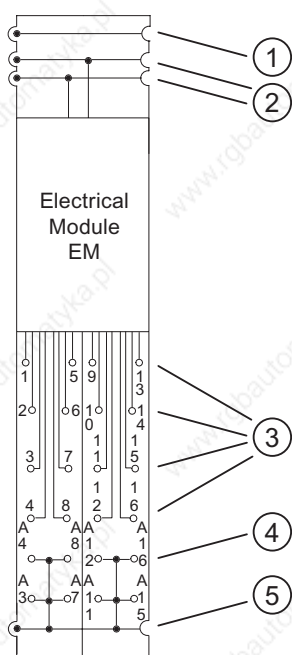
1.11 TM-E30S46-A1 and TM-E30C46-A1 universal terminal modules (6ES7193-4CFx0-0AA0)

Properties

- Universal terminal module for all 30 mm wide electronic modules
- available in two variants: screw terminal, spring terminal
- The electronic module determines the assignment to terminals 1 to 16.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- Access to the AUX1 potential via terminals A4, A8, A3, A7 and A12, A16, A11, A15

Block diagram

Block diagram of the TM-E30S46-A1 and TM-E30C46-A1 terminal module



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Connection of terminals A4, A8, A3, A7 and A12, A16, A11, A15 as productive conductor terminals or potential terminals of any kind
- (5) Uninterrupted AUX1 bus with a connection to terminals A4, A3, A8, A7 and A12, A11, A16, A15

TM-E30x46-A1 Technical Specifications (6ES7193-4CFx0-0AA0)

| Dimensions and Weight | |
|---------------------------|------------------------------|
| Dimensions W × H × D (mm) | 30 x 157 x 43 |
| Weight | Approx. 158 g (TM-E30S46-A1) |
| | Approx. 131 g (TM-E30C46-A1) |

Description of the electronic modules

You can find a description of the 4/8 F-DI 24 VDC PROFIsafe and the 4 F-DO 24 VDC/2 A PROFIsafe electronic modules you can use with the above terminal modules in the *ET 200S Distributed I/O Module, Fail-Safe Modules* manual.

1.12 TM-E30S44-01 and TM-E30C44-01 terminal modules (6ES7193-4CGx0-0AA0)

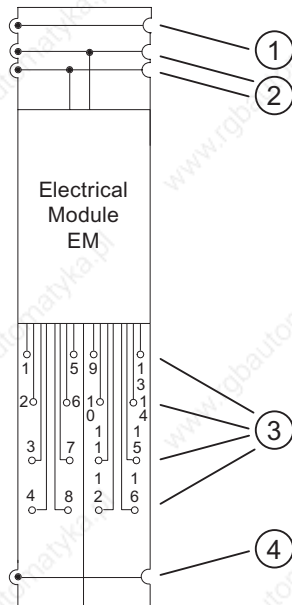
Properties

- Terminal module for 30 mm wide electronic modules and fail-safe electronic modules
- available in two variants: screw terminal, spring terminal
- The electronic module determines the assignment to terminals 1 to 16.
- Pass-through AUX1 bus with electrical connection to the next potential group to the left
- No access to the AUX1 potential through terminals

1.12 TM-E30S44-01 and TM-E30C44-01 terminal modules (6ES7193-4CGx0-0AA0)

Block diagram

Block diagram of the TM-E30S44-01 and TM-E30C44-01 terminal module



- (1) Backplane bus
- (2) Uninterrupted power buses from the power module
- (3) Terminals with connection to the electronic module
- (4) Uninterrupted AUX1 bus without a connection to the terminals

TM-E30x44-01 Technical Specifications (6ES7193-4CGx0-0AA0)

| Dimensions and Weight | |
|---------------------------|--|
| Dimensions W × H × D (mm) | 30 × 132 × 43 |
| Weight | Approx. 110 g (TM-E30C44-01) Approx. 125 g (TM-E30S44-01) |

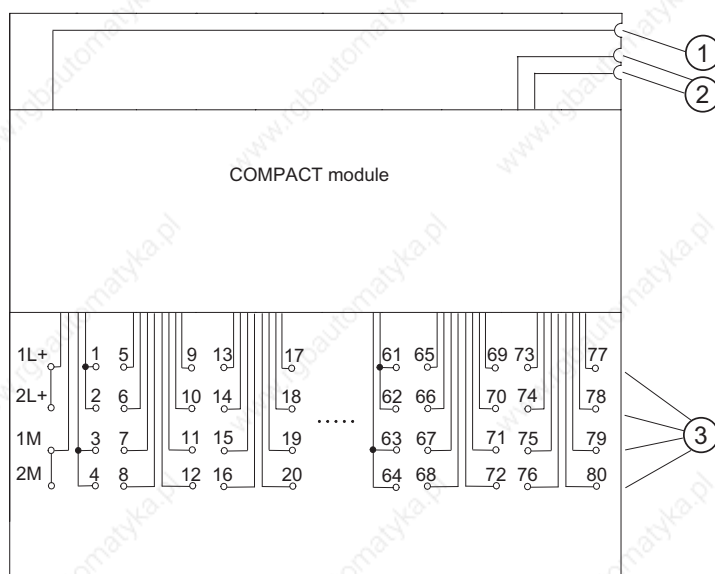
1.13 TM-C120S and TM-C120C terminal modules (6ES7193-4DLx0-0AA0)

Properties

- Terminal module for the COMPACT modules
- available in two variants: screw terminal, spring terminal
- The COMPACT module determines the assignment to terminals 1 to 80.
- Infeed of the power buses to the electronic modules from the last potential group of the COMPACT module
- uninterrupted AUX1 bus
- No access to the AUX1 potential through terminals
- with 40-pin supplementary terminal; any additional required potentials can be applied there

Block diagram

Block diagram of the TM-C120S and TM-C120C terminal modules



- (1) Backplane bus
- (2) Infeed of the power buses to the electronic modules (from the last potential group of the COMPACT module)
- (3) Terminals with connection to the COMPACT module

TM-C120x Technical Specifications (6ES7193-4DLx0-0AA0)

| Dimensions and Weight | |
|-------------------------------|----------------|
| Dimensions W × H × D (mm) | 120 × 132 × 43 |
| • Screw-type/spring terminals | |
| Weight | Approx. 335 g |

1.14 TE-U120S4x10 and TE-U120C4x10 supplementary terminal (6ES7193-4FLx0-0AA0)

Properties

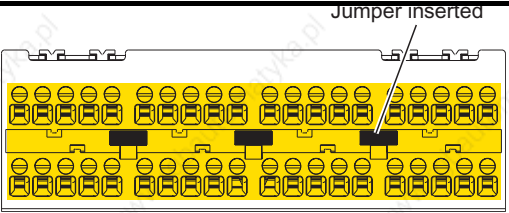
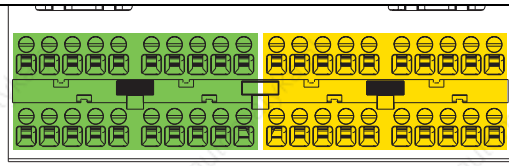
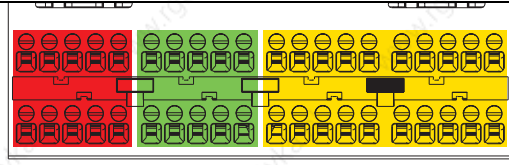
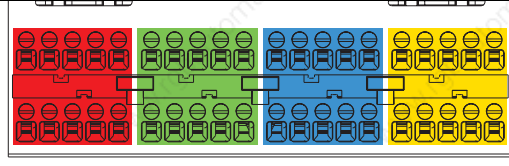
- 40-pin extension for
 - the TM-C terminal module for COMPACT modules
 - any terminal modules with a width of 120 mm
- available in two variants: screw terminal, spring terminal
- Any additionally required potentials can be applied to the supplementary terminal, e.g. with 3 or 4-wire connection of sensors or actuators.
- The four potential groups on the supplementary terminal can be adapted (extended) for the local requirements with pluggable bridges.

Extending the potential groups

The supplementary terminal is fitted with three pluggable bridges on delivery.

If it is necessary to apply more than one potential to the supplementary terminal, the potential groups on the supplementary terminal can be extended. This is done with pluggable bridges that connect two or more groups. After removal of corresponding bridges terminals are available for additional potentials.

Table 1-1 Potential groups on the supplementary terminal

| Quantity | | Position on the supplementary terminal |
|------------------------------|------------------|---|
| inserted bridges | Potential groups | |
| 3 ¹ | 1 |  <p>Jumper inserted</p> |
| 2 | 2 |  |
| 1 | 3 |  |
| None | 4 |  |
| ¹ Delivery status | | |

Terminal modules

1.14 TE-U120S4x10 and TE-U120C4x10 supplementary terminal (6ES7193-4FLx0-0AA0)

TE-U120x4x10 Technical Specifications (6ES7193-4FLx0-0AA0)

| Dimensions and Weight | |
|---|--------------------------------|
| Dimensions W × H × D (mm) <ul style="list-style-type: none">• Screw-type/spring terminals• with mounting bracket | 120 × 38 × 30 120 × 79 × 30 |
| Weight | Approx. 160 g |
| Terminal-specific data | |
| Connectable potentials | Up to 230 VAC |
| Current-carrying capacity (from supplementary terminal and pluggable bridges) | 10 A |

Power modules

2.1 Configuring the address space

Address area for option handling and status byte

You can control and monitor option handling, and evaluate the status byte of the power module using the control (PIQ) and feedback interface (PII).

The address range of the control (PIQ) and feedback interface (PII) depends on the configuration or selection of the corresponding entry in the configuration software.

This table shows the PII feedback interface and the PIQ control interface for different entries.

Table 2-1 PII feedback interface and PIQ control interface

| with STEP 7, HW Config or COM PROFIBUS or other configuration software | Feedback interface PII | | Control interface PIQ | |
|---|------------------------|-----------------|-----------------------|-----------------|
| Usual entry for the power module | --- | | --- | |
| Ends in ...S | IBx | Status byte | --- | |
| Ends in ...O | IBx ::: IBx+7 | Option handling | QBx ::: QBx+7 | Option handling |
| Ends in ...SO | IBx ::: IBx+7 | Option handling | QBx ::: QBx+7 | Option handling |
| | IBx+8 | Status byte | QBx+8 | not applicable |

2.2 Parameters for power modules

Status byte power modules

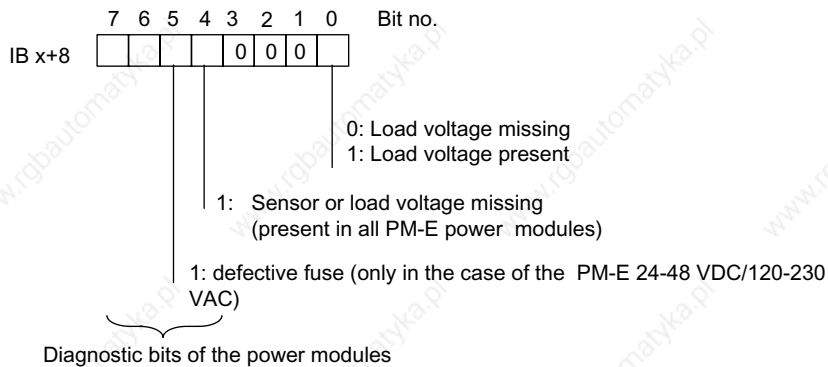


Figure 2-1 Assignment of status byte for power modules

2.2 Parameters for power modules

Parameters

The following table lists the power module parameters.

Table 2-2 Parameters for power modules

| Power module | | | Value range | Default setting | Applicability |
|-----------------------------------|-----------------------------------|---|----------------|-----------------|---------------|
| PM-E DC24V | PM E-24 ..48 VDC | PM-E 24 to 48 VDC/ 24 to 230 VAC ¹ | | | |
| Diagnostics: Missing load voltage | Diagnostics: Missing load voltage | Diagnostics: Missing load voltage | Disable/enable | Disable | Power module |
| --- | --- | Diagnostics: Fuse blown | Disable/enable | Disable | Power module |
| --- | --- | Voltage type | DC/AC | DC | Power module |

¹ The PM-E 24 VDC to 48 VDC, 24 VAC to 230 VAC power module (6ES7138-4CB11-0AB0) is not a direct replacement for the device with the order number 6ES7138-4CB00-0AB0 for AC applications because you have to select either AC or DC supply voltage. In the case of DC applications, the new module is a direct replacement because the default setting of the new parameter is "DC". If you want to replace the device 6ES7138-4CB00-0AB0 in AC applications, you have to create a new hardware configuration and set the value "AC" for the load voltage type parameter.

Here is a more detailed explanation of the parameters.

Diagnostics: Missing load voltage

Use this parameter to enable a diagnostic message because of missing load voltage.

If there is no load voltage only the diagnostic message of the affected power module is sent to the DP master. The SF error LEDs of all modules in the relevant potential group light.

Diagnostics: Fuse blown

Use this parameter to enable a diagnostic message because of a blown fuse.

If a fuse has blown only the diagnostic message of the affected power module is sent to the DP master. The SF error LEDs of all modules in the relevant potential group light.

Voltage type

Use this parameter to select the load voltage that is connected to the power module: Direct voltage or alternating voltage.

If the load voltage fails or a fuse blows the correct diagnosis is returned.

2.3 PM-E 24 VDC power module (6ES7138-4CA01-0AA0)

Properties

- The PM-E 24 VDC power module monitors the supply voltage for all the electronic modules in the potential group. The supply voltage is fed in by means of the TM-P terminal module.
- You can use any electronic module in the potential group of the PM-E 24 VDC power module except the 2DI 120 VAC Standard, 2DI 230 VAC Standard and 2DO 24 VAC to 230 VAC/1 A.
- The current status of the power module is stored in the status byte in the process input image (PII). This is updated irrespective of whether the "No Load Voltage" diagnosis has been enabled.
- The PM-E 24 VDC to 48 VDC power module is suitable for fail-safe modules.



Caution

Only connect the specified rated load voltage of 24 VDC to the TM-P terminal module of the power module.

The connected rated load voltage must correspond to the supply voltage of the electronic modules in the voltage group.

2.3 PM-E 24 VDC power module (6ES7138-4CA01-0AA0)

General terminal assignment

Note

Terminals A4 and A8 are only available at specified terminal modules.

| Terminal assignment for PM-E 24 VDC (6ES7138-4CA01-0AA0) | | | | |
|--|------------|----------|------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 2 | L+ | 6 | L+ | <ul style="list-style-type: none"> L+ Rated load voltage 24 VDC M: Ground AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 3 | M | 7 | M | |
| A4 | AUX1 | A8 | AUX1 | |

Usable terminal modules

| Usable terminal modules for PM-E 24 VDC (6ES7138-4CA01-0AA0) | | | |
|--|--------------------------------------|--------------------------------------|---------------------|
| TM-P15C23-A1 (6ES7193-4CC30-0AA0) | TM-P15C23-A0 (6ES7193-4CD30-0AA0) | TM-P15C22-01 (6ES7193-4CE10-0AA0) | ← Spring terminal |
| TM-P15S23-A1 (6ES7193-4CC20-0AA0) | TM-P15S23-A0 (6ES7193-4CD20-0AA0) | TM-P15S22-01 (6ES7193-4CE00-0AA0) | ← Screw terminal |
| TM-P15N23-A1 (6ES7193-4CC70-0AA0) | TM-P15N23-A0 (6ES7193-4CD70-0AA0) | TM-P15N22-01 (6ES7193-4CE60-0AA0) | ← Fast Connect |
| | | | Wiring examples |

2.3 PM-E 24 VDC power module (6ES7138-4CA01-0AA0)

Block diagram

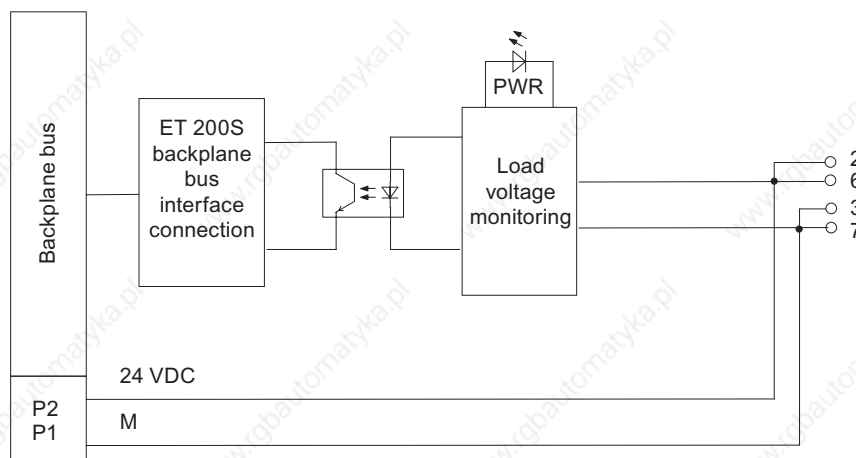


Figure 2-2 Block diagram of the PM-E 24 VDC power module

PM-E 24 VDC power module technical specifications (6ES7138-4CA01-0AA0)

| Dimensions and Weight | |
|--|-----------------------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Voltages, currents, potentials | |
| Rated load voltage | 24 VDC |
| • Overvoltage protection | no |
| Protection with automatic circuit breakers | yes, tripping characteristic B, C |
| Max. current-carrying capacity (up to 60° C) | 10 A |
| • Short-circuit protection | no |
| Galvanic isolation | |
| • Between rated load voltage and backplane bus | Yes |
| • Between the power modules | Yes |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • From the load voltage L+ (no load) | max. 4 mA |
| Power dissipation of the module | typ. 100 mW |
| Parameter length | 3 bytes |
| Status, interrupts, diagnostics | |
| Diagnostic function | Yes |
| • General fault | Red "SF" LED |
| • Load voltage monitoring | Green "PWR" LED |
| • Diagnostic information readable | Yes |

2.4 PM-E 24-48 VDC power module (6ES7138-4CA50-0AA0)

Properties

- The PM-E 24 VDC to 48 VDC power module monitors the supply voltage for all the electronic modules in the voltage group. The supply voltage is fed in by means of the TM-P terminal module.
- You can use all the electronic modules except the 2DI 120 VAC Standard, 2DI 230 VAC Standard, and 2DO 24 VAC to 230 VAC/1 A in the voltage group of the PM-E 24 VDC to 48 VDC power module.
- Control interface (PIQ) and feedback interface (PII) in the process image for option handling.
- The current status of the power module is stored in the status byte in the process input image (PII). This is updated irrespective of whether the "No Load Voltage" diagnosis has been enabled.
- The PM-E 24 VDC to 48 VDC power module is suitable for fail-safe modules.



Caution

Only connect the specified rated load voltage of 24 VDC to 48 VDC to the TM-P terminal module of the power module.

The connected rated load voltage must correspond to the supply voltage of the electronic modules in the voltage group.

General terminal assignment

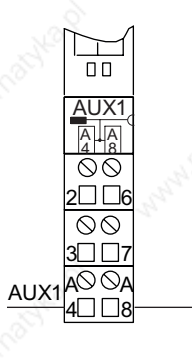
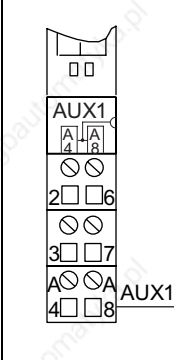
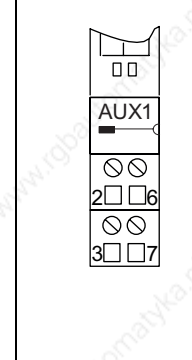
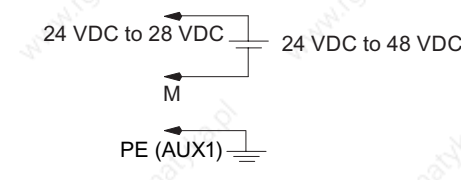
Note

Terminals A4 and A8 are only available at specified terminal modules.

| Terminal assignment for PM-E 24 VDC to 48 VDC (6ES7138-4CA50-0AA0) | | | | |
|--|------------|----------|------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 2 | L+ | 6 | L+ | <ul style="list-style-type: none"> • L+ Rated load voltage 24 VDC to 48 VDC • M: Ground • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 3 | M | 7 | M | |
| A4 | AUX1 | A8 | AUX1 | |

Usable terminal modules

2.4 PM-E 24-48 VDC power module (6ES7138-4CA50-0AA0)

| Usable terminal modules for PM-E 24-48 VDC (6ES7138-4CA50-0AA0) | | | |
|---|---|---|---|
| TM-P15C23-A1 (6ES7193-4CC30-0AA0) | TM-P15C23-A0 (6ES7193-4CD30-0AA0) | TM-P15C22-01 (6ES7193-4CE10-0AA0) | ← Spring terminal |
| TM-P15S23-A1 (6ES7193-4CC20-0AA0) | TM-P15S23-A0 (6ES7193-4CD20-0AA0) | TM-P15S22-01 (6ES7193-4CE00-0AA0) | ← Screw terminal |
| TM-P15N23-A1 (6ES7193-4CC70-0AA0) | TM-P15N23-A0 (6ES7193-4CD70-0AA0) | TM-P15N22-01 (6ES7193-4CE60-0AA0) | ← Fast Connect |
|  |  |  | <p>Wiring examples</p>  |

Block diagram

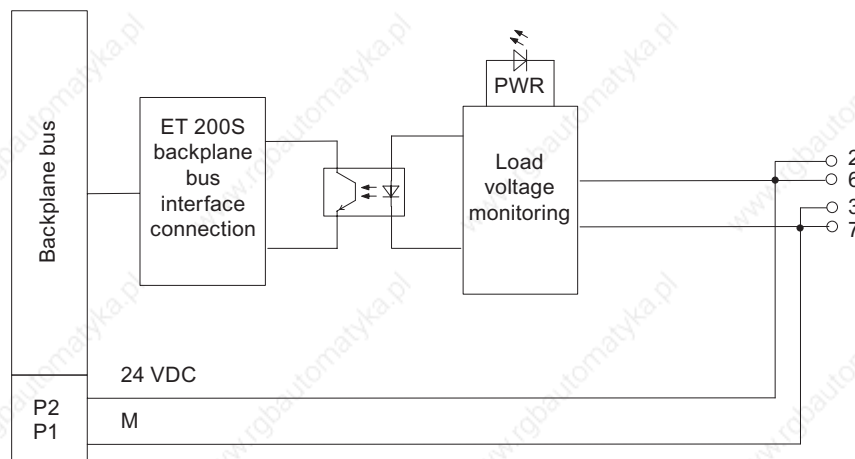


Figure 2-3 Block diagram of the PM-E 24 VDC to 48 VDC power module

PM-E 24 VDC to 48 VDC technical specifications (6ES7138-4CA50-0AA0)

| Dimensions and Weight | |
|--|-----------------------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Voltages, currents, potentials | |
| Rated load voltage | 24 VDC to 48 VDC |
| • Reverse polarity protection | Yes |
| • Overvoltage protection | no |
| Protection with automatic circuit breakers | yes, tripping characteristic B, C |
| Max. current-carrying capacity (up to 60° C) | 10 A |
| • Short-circuit protection | no |
| Galvanic isolation | |
| • Between rated load voltage and backplane bus | Yes |
| • Between the power modules | Yes |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • From the load voltage L+ (no load) | max. 12 mA |
| Power dissipation of the module | typ. 500 mW |
| Parameter length | 3 bytes |
| Status, interrupts, diagnostics | |
| Diagnostic function | Yes |
| • Group error | Red "SF" LED |
| • Load voltage monitoring | Green "PWR" LED |
| • Diagnostic information readable | Yes |

Reference

Information on the address space of the inputs and outputs can be found in the *ET 200S Operating Instructions*.

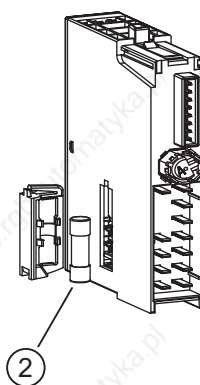
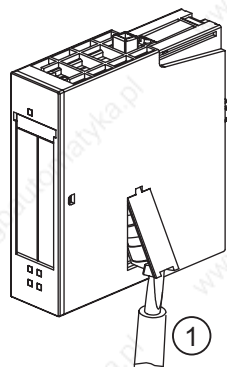
2.5 PM-E 24-48 VDC/24-230 VAC power module (6ES7138-4CB11-0AB0)

Characteristics

The PM-E 24 VDC to 48 VDC/24 VAC to 230 VAC power module

- Monitors the supply voltage for all the electronic modules in the voltage group. The supply voltage is fed in by means of the TM-P terminal module.
- Can be used universally and can be assigned parameters for DC and AC load voltage for use with any electronic module.
- Is required at least once for the ET 200S (to the right of the interface module).
Exception: Design of the ET 200S with an IM151-1 COMPACT
- Control interface (PIQ) and feedback interface (PII) in the process image for option handling.
- The current status of the power module is stored in the status byte in the process input image (PII). This is updated irrespective of whether the "No Load Voltage" diagnosis has been enabled.
- Is additionally equipped with a replaceable fuse (5 mm x 20 mm).

Replacing the fuse:



- (1) Screwdriver with 3 mm blade
(2) Fuse

General terminal assignment

Note

Terminals A4 and A8 are only available at specified terminal modules.

Power modules

2.5 PM-E 24-48 VDC/24-230 VAC power module (6ES7138-4CB11-0AB0)

| PM-E 24 VDC to 48 VDC/24 VAC to 230 VAC terminal assignment (6ES7138-4CB11-0AB0) | | | | |
|--|------------|----------|------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 2 | L+/L1 | 6 | L+/L1 | <ul style="list-style-type: none"> L+/L1: Rated load voltage 24 VDC to 48 VDC M: Chassis ground N: Neutral conductor AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 3 | M/ N | 7 | M/ N | |
| A4 | AUX1 | A8 | AUX1 | |

Usable terminal modules

| PM-E 24 VDC to 48 VDC/24 VAC to 230 VAC terminal modules can be used (6ES7138-4CB11-0AB0) | | | |
|---|--------------------------------------|--------------------------------------|------------------------|
| TM-P15C23-A1 (6ES7193-4CC30-0AA0) | TM-P15C23-A0 (6ES7193-4CD30-0AA0) | TM-P15C22-01 (6ES7193-4CE10-0AA0) | ← Spring terminal |
| TM-P15S23-A1 (6ES7193-4CC20-0AA0) | TM-P15S23-A0 (6ES7193-4CD20-0AA0) | TM-P15S22-01 (6ES7193-4CE00-0AA0) | ← Screw-type terminal |
| TM-P15N23-A1 (6ES7193-4CC70-0AA0) | TM-P15N23-A0 (6ES7193-4CD70-0AA0) | TM-P15N22-01 (6ES7193-4CE60-0AA0) | ← Fast Connect |
| | | | <p>Wiring examples</p> |

2.5 PM-E 24-48 VDC/24-230 VAC power module (6ES7138-4CB11-0AB0)

Block diagram

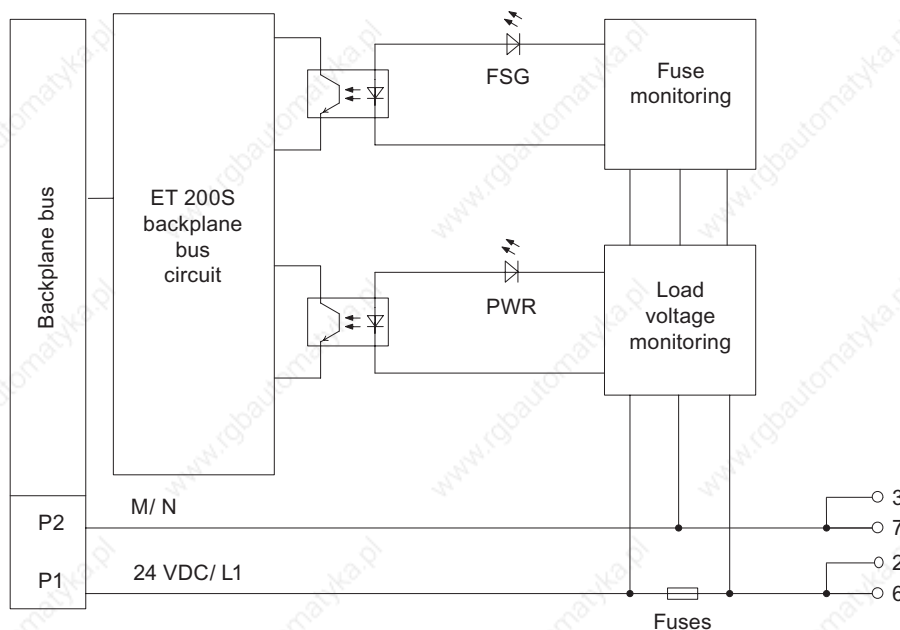


Figure 2-4 Block diagram of the PM-E 24-48 VDC, 24-230 VAC

PM-E 24 VDC to 48 VDC/24 VAC to 230 VAC technical specifications (6ES7138-4CB11-0AB0)

| Dimensions and Weight | |
|--|--|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | 34 g |
| Voltages, currents, potentials | |
| Rated load voltage | 24 VDC to 56.7 VDC 24 V to 48 V / 120 V / 230 V AC |
| • Overvoltage protection | Yes |
| Protection with automatic circuit breakers | Yes, tripping characteristic B, C |
| Max. current-carrying capacity | 10 A |
| • For 24 to 56.7 VDC | Up to 30°C: max. 10 A Up to 40°C: max. 9 A Up to 60°C: max. 7 A |
| • For 24 to 48/120/230 VAC | Up to 30°C: max. 8 A Up to 40°C: max. 7 A Up to 60°C: max. 5 A |
| • Short-circuit protection | Yes, IEC 127-2/1, 250 V, 10 A, fast fuse (5 x 20 mm), replaceable ¹ |

Power modules

2.5 PM-E 24-48 VDC/24-230 VAC power module (6ES7138-4CB11-0AB0)

| | |
|--|-----------------|
| Electrical isolation | |
| <ul style="list-style-type: none">Between rated load voltage and backplane bus | Yes |
| <ul style="list-style-type: none">Between the power modules | Yes |
| Insulation test voltage | 1500 VAC |
| Current consumption from backplane bus | max. 9.5 mA |
| <ul style="list-style-type: none">From load voltage L1/L+ (no load) | max. 9 mA |
| Power dissipation of the module | max. 5 W |
| Parameter length | 3 bytes |
| Status, alarms, diagnostics | |
| Diagnostic function | Yes |
| <ul style="list-style-type: none">General fault | Red LED "SF" |
| <ul style="list-style-type: none">Load voltage monitoring | Green LED "PWR" |
| <ul style="list-style-type: none">Fuse | Green LED "FSG" |
| <ul style="list-style-type: none">Diagnostic information can be displayed | Yes |
| ¹ The fuses on this module are only additional fuses. External overcurrent protection (suitable for branch circuits in accordance with the applicable national regulations for electrical engineering) is required in the supply lines of the load circuit. | |

Reference

Information on the address space of the inputs and outputs can be found in the *ET 200S Operating Instructions*.

2.6 Placing power modules and connecting them to common potential

Placing and Connecting to Common Potential

You can choose where to position the power modules in the ET 200S. Every TM-P terminal module (for a power module) that you install in the ET 200S opens a new voltage group. All sensor and load supplies of the downstream electronic modules are fed from this TM-P terminal module (for a power module). If you place an additional TM-P terminal module after an electronic module/motor starter, you interrupt the potential buses (P1/P2) and simultaneously open a new voltage group. This enables sensor and load supplies to be individually connected to common potential.

AUX(iliary) bus (AUX1)

A TM-P terminal module (for a power module) allows you to connect additional potential (up to the maximum rated load voltage of the module), which you can apply by means of the AUX(iliary) bus.

You can set the AUX(iliary) bus individually:

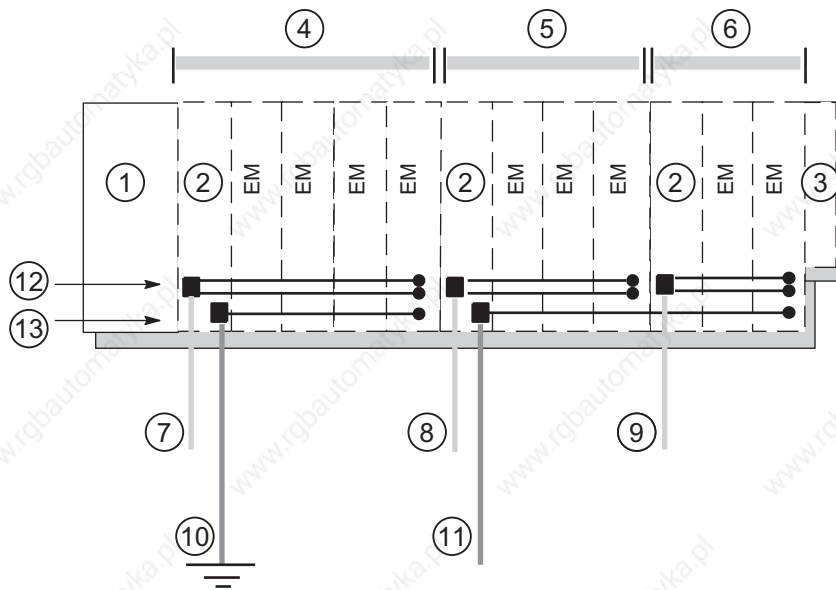
- As a protective conductor bar
- For additionally required voltage

The AUX1 bus is laid out as follows:

- Maximum current-carrying capacity (at 60 °C ambient temperature): 10 A
- Permitted voltage: 230 VAC/DC

2.6 Placing power modules and connecting them to common potential

Placing power modules and connecting them to common potential



- | | | | |
|---|--------------------|---|-------------------------------|
| ① | Interface module | ⑧ | Supply voltage 2 |
| ② | Power module | ⑨ | Supply voltage 3 |
| ③ | Terminating module | ⑩ | Protective conductor |
| ④ | Voltage group 1 | ⑪ | Additionally required voltage |
| ⑤ | Voltage group 2 | ⑫ | P1/P2 power buses |
| ⑥ | Voltage group 3 | ⑬ | AUX1 bus |
| ⑦ | Supply voltage 1 | | |



Warning

If you connect the AUX1 bus to common potential independently of the P1/P2 buses (different voltages), there is no safe electrical separation between the AUX1 bus and the P1/P2 buses.

Connecting different potentials to the AUX1 bus

Note

If you apply different potentials to the AUX1 bus within an ET 200S station, you must separate the voltage groups by means of a power module with the TM-P15S23-A0 terminal module.

2.7 Example of a configuration: Terminal modules for power modules

2.7 Example of a configuration: Terminal modules for power modules

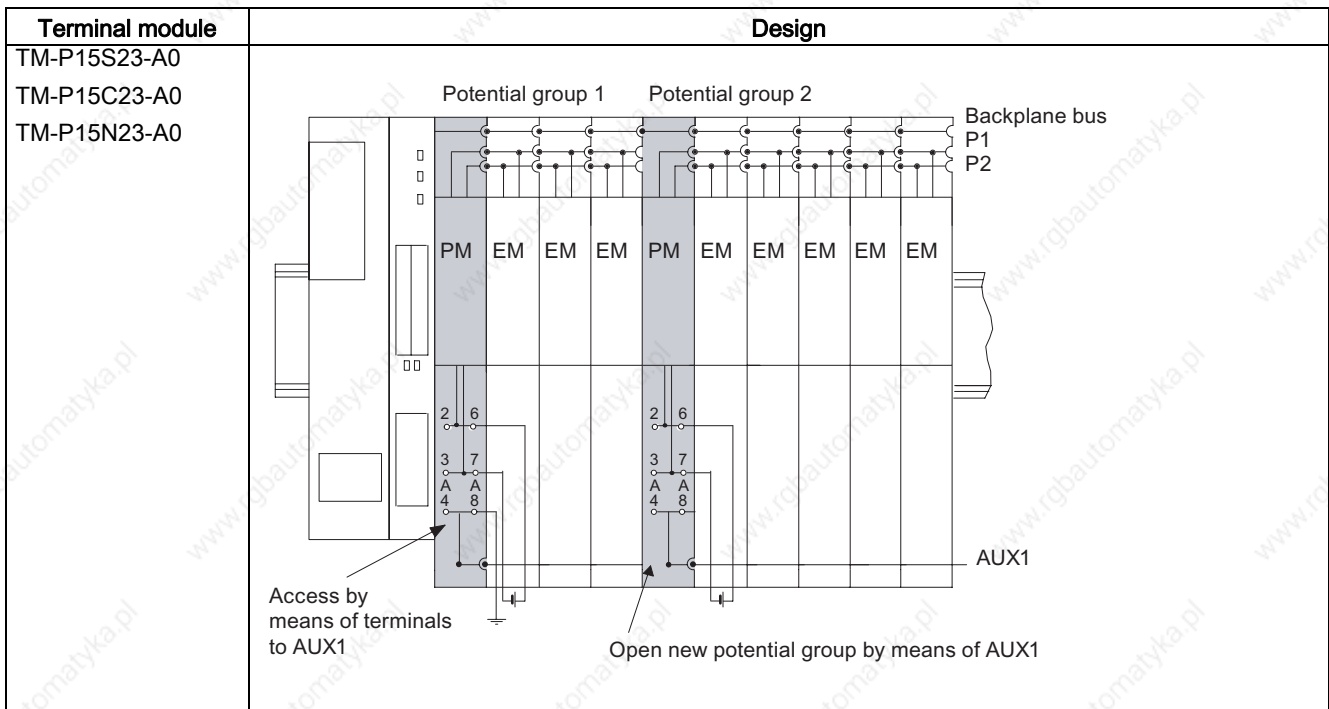
Introduction

The following table shows how terminal modules for power modules can be used:

Table 2-3 Terminal modules for power modules

| Terminal module | Design |
|--|--------|
| TM-P15S22-01 TM-P15C22-01 TM-P15N22-01 | |
| TM-P15S23-A1 TM-P15C23-A1 TM-P15N23-A1 | |

2.7 Example of a configuration: Terminal modules for power modules



2.7 Example of a configuration: Terminal modules for power modules

| Terminal module | Design |
|------------------------------|--|
| TM-P30S44-A0 TM-P30C44-A0 | <p>Potential group 1 Potential group 2</p> <p>Backplane bus P1 P2</p> <p>PM EM PM EM</p> <p>1 5 2 6 3 7 4 8</p> <p>AUX1</p> <p>Access by means of terminals to AUX1</p> <p>Open new potential group by means of AUX1</p> |
| TM-PF30S47-F1 | <p>Potential group 1 Potential group 2</p> <p>Backplane bus P1 P2</p> <p>PM EM PM EM</p> <p>2 2 0 7 2 2 1 8</p> <p>AUX1</p> |

2.8 Finding the correct power module for an I/O device

Applicability of power modules

The following table describes which power modules you can use with the different I/O modules:

| Power modules | I/O modules |
|---|--|
| PM-E 24 VDC | Can be used with all electronic modules except the 120 VAC Standard, 2DI 230 VAC Standard, and 2DO 120/230 VAC. |
| PM-E 24 VDC to 48 VDC | Applicable <ul style="list-style-type: none"> • Can be used with all electronic modules except the 2DI 120 VAC Standard, 2DI 230 VAC Standard, and 2DO 120 VAC/230 VAC. • For UC electronic modules if the maximum load voltage is 24 VDC and AC is not required |
| PM-E 24 VDC to 48 VDC/24 VAC to 230 VAC | Can be used with all electronic modules. |
| PM-E F pm 24 VDC PROFIsafe | For the fail-safe modules. See the <i>ET 200S Distributed I/O System Fail-Safe Modules</i> manual |
| PM-E F pp 24 VDC PROFIsafe | |
| PM-E F 24 VDC PROFIsafe | |
| PM-D | For motor starters and frequency converters. See <i>ET 200S Motor Starter</i> manual <i>ET 200S FC Frequency Converter</i> operating instructions |
| PM-D F | For fail-safe applications with motor starter or frequency converter. See <i>ET 200S Motor Starter</i> manual <i>ET 200S FC Frequency Converter</i> operating instructions |

Digital electronic modules

3.1 Parameters for digital electronic modules

3.1.1 Parameters for digital input modules

This table shows the parameters for digital input modules:

Table 3-1 Parameters for digital input modules

| 2DI 24 VDC High Feature | 4DI 24 VDC High Feature | 4DI 24 to 48 VUC High Feature | 2DI/ 4DI 24 VDC Standard 4DI 24 VDC/SRC Standard 2DI 120 VAC Standard 4DI 230 VAC Standard | Range of values | Default setting | Applicability |
|--|--|--------------------------------------|---|---|-----------------|---------------|
| Hardware interrupt ³ | | --- | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| --- | | Diagnostic interrupt | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Input delay ¹ | | --- | --- | <ul style="list-style-type: none"> • 0.1 ms • 0.5 ms • 3 ms • 15 ms | 3 ms | Module |
| Diagnostics: Short-circuit to M ² | | --- | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| --- | | Diagnostics: Wire break ⁴ | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| --- | | Diagnostics: Blown fuse | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| --- | | Diagnostics: No load voltage | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Trigger for hardware interrupt, rising edge ³ | Trigger for hardware interrupt, rising edge ³ | --- | --- | <ul style="list-style-type: none"> • disable • Enable | disable | Channel 0 |
| --- | | Channel 1 | | | | |
| --- | | Channel 2 | | | | |

3.1 Parameters for digital electronic modules

| 2DI 24 VDC High Feature | 4DI 24 VDC High Feature | 4DI 24 to 48 VUC High Feature | 2DI/ 4DI 24 VDC Standard 4DI 24 VDC/SRC Standard 2DI 120 VAC Standard 4DI 230 VAC Standard | Range of values | Default setting | Applicability |
|-------------------------|-------------------------|-------------------------------|---|-----------------|-----------------|---------------|
| | | | | | | Channel 3 |

¹ The input delay applies to "0" to "1" and to "1" to "0".

² Short circuit of the sensor supply.

³ Can only be assigned parameters for the IM151-1 High Feature interface module and the IM151-7 CPU

⁴ If the wire break check is activated, all the unused inputs must be stabilized to prevent them from triggering a module wire break. To do this, connect a resistor between terminal 24/48 V (3, A4, 7, A8) and the free input. The resistor must provide at least 0.5 mA of input current (see "Sensor Switching" in the table of technical specifications). This ensures that sufficient current is flowing to prevent wire break detection.

The sensor must supply at least 0.5 mA when switched off (otherwise wire break will be detected when switched off). Alternatively, a resistor can be connected parallel to the sensor terminals (the current must be at least 0.5 mA).

3.1.2 Parameters for 4DI NAMUR

This table shows the parameters for 4DI NAMUR:

Table 3-2 Parameters for 4DI NAMUR

| 4DI NAMUR | Value range | Default setting | Applicability |
|---------------------------------|--|------------------|---------------|
| Diagnostic interrupt | <ul style="list-style-type: none"> • Enable • Disable | Disable | Module |
| Sensor type | <ul style="list-style-type: none"> • Channel disabled • NAMUR sensor • Open single contact • Single contact, closed with 10 kΩ • NAMUR changeover contact • Open changeover contact • Changeover contact, closed with 10 kΩ | Channel disabled | Channel |
| Pulse stretching | <ul style="list-style-type: none"> • None • 0.5 s • 1 s • 2 s | None | Channel |
| Diagnostics No sensor supply | <ul style="list-style-type: none"> • Enable • Disable | Disable | Module |

3.1 Parameters for digital electronic modules

| 4DI NAMUR | Value range | Default setting | Applicability |
|---|---|-----------------|---------------|
| Diagnostics: Wire break | <ul style="list-style-type: none"> • Enable • Disable | Disable | Channel |
| Short-circuit diagnostics ¹ | <ul style="list-style-type: none"> • Enable • Disable | Disable | Channel |
| Chatter monitoring: Monitoring window ² | <ul style="list-style-type: none"> • 0.5 s • 1 s to 100 s (can be set at increments of 1 s) | 0.5 s | Channel |
| Chatter monitoring: Number of signal changes | <ul style="list-style-type: none"> • Disable • 2 to 31 | Disable | Channel |

¹ Only for NAMUR changeover contacts and NAMUR sensors.
² The parameters can only be set when the number of signal changes for chatter monitoring is activated

3.1.3 Parameters for digital output modules

This table shows the parameters for digital output modules:

Table 3-3 Parameters for digital output modules

| 2DO 24 VDC/0.5 A HF | 2DO 24 VAC to 230 VAC/1 A | 2RO NO NC 24-48 VDC/5 A 24- 230 VAC/ 5 A | 2DO/ 4DO 24 VDC/0.5 A Standard | Value range | Default setting | Applicability |
|---|--|--|--------------------------------------|--|---------------------------|---------------|
| 2DO 24 VDC/2 A HF | 2RO NO 24 VDC to 120 VDC/5 A 24 VAC to 230 VAC/5 A | | 2DO/ 4DO 24 VDC/2 A Standard | | | |
| Behavior in event of CPU/master STOP | | | --- | <ul style="list-style-type: none"> • Switch substitution value • Keep last value | Switch substitution value | Module |
| Substitute value ¹ | | | --- | <ul style="list-style-type: none"> • "0" • "1" | "0" | Channel |
| Diagnostics: Wire break ² | --- | | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |
| Diagnostics: Short-circuit to M | --- | | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |

¹ If the interface module or COMPACT module becomes deenergized, the digital output modules will not produce substitute values. Output value = 0.
² A wire break is only detected in the switched output state.

3.2 Parameters of the Digital Electronic Modules

3.2.1 Hardware interrupt

This parameter enables the hardware interrupts for the module.

3.2.2 Input delay

This parameter can be used to suppress signal interference. Changes in the signal are only detected if they remain stable for longer than the configured input delay time.

3.2.3 Trigger for hardware interrupt, rising edge

This parameter can be used to enable a hardware interrupt with rising edge (a signal status change) by channel.

3.2.4 Pulse stretching

Definition

The pulse stretching is a function used to modify a digital input signal. A pulse at a digital input is stretched to at least the length set in the parameters. If the input pulse is already longer than the selected length, it is not changed

Principle of Pulse Stretching

The figure below shows a few examples of input pulse modification.

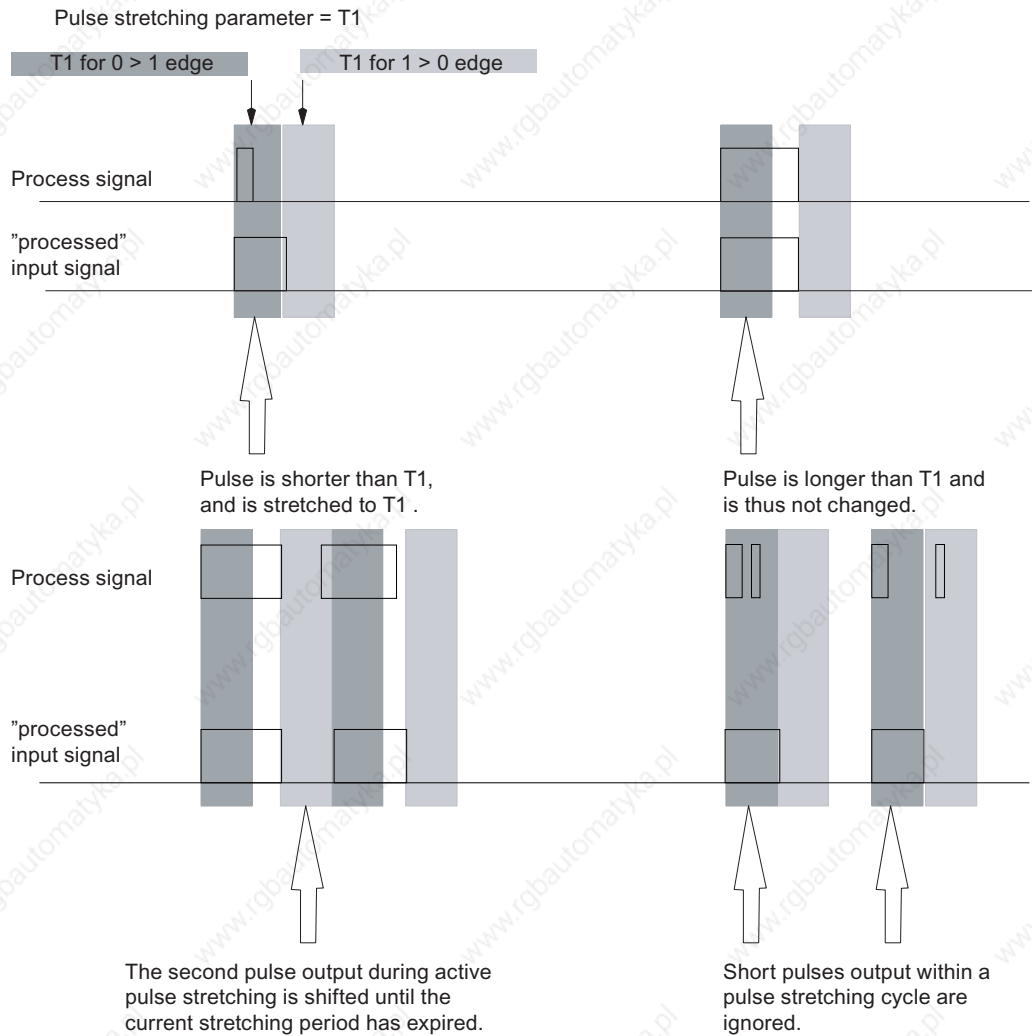


Figure 3-1 Principle of Pulse Stretching

Note

If you set pulse stretching for an input channel, this also affects the flutter monitoring enabled for this channel. The "pulse stretched" signal is the input signal for flutter monitoring. You should therefore adapt the pulse stretching parameters and flutter monitoring functions to each other. Select appropriate parameter values in order to tune the functions to your process.

3.2.5 Chatter monitoring

Definition

Chatter monitoring is a process control function for digital input signals. It detects and reports signal characteristics that are unusual from a process engineering viewpoint, such as the input signal fluctuating too frequently between "0" and "1". If signal characteristics like these occur, it is a sign that the sensors are faulty or that there are instabilities from a process engineering viewpoint.

Activating chatter monitoring

You activate chatter monitoring by setting the number of signal changes for chatter monitoring to a value other than zero.

Detecting unusual signal patterns

Each input channel has a monitoring window that has been assigned parameters. The monitoring window is started the first time the input signal changes. If the input signal changes more within the monitoring window than the configured number of signal changes, this is recognized as a flutter error. If a flutter error is not detected within the monitoring window, the monitoring window is started again at the next signal change.

Reporting a chatter error

If a chatter error has occurred, the current signal status is entered in the process image and the value of the signal is set to "invalid". A chatter error is also entered as diagnostic information, triggering an incoming diagnostic interrupt.

You must evaluate and process the status of the value and the diagnostic information in the user program.

Resetting a chatter error

If no further chattering of the input signal is detected within three monitoring windows, the diagnostic entry is removed and an outgoing diagnostic interrupt is triggered. The status of the value of the current signal in the process image is set to "valid".

Principles

The following figure gives you another graphic illustration of the principle of chatter monitoring.

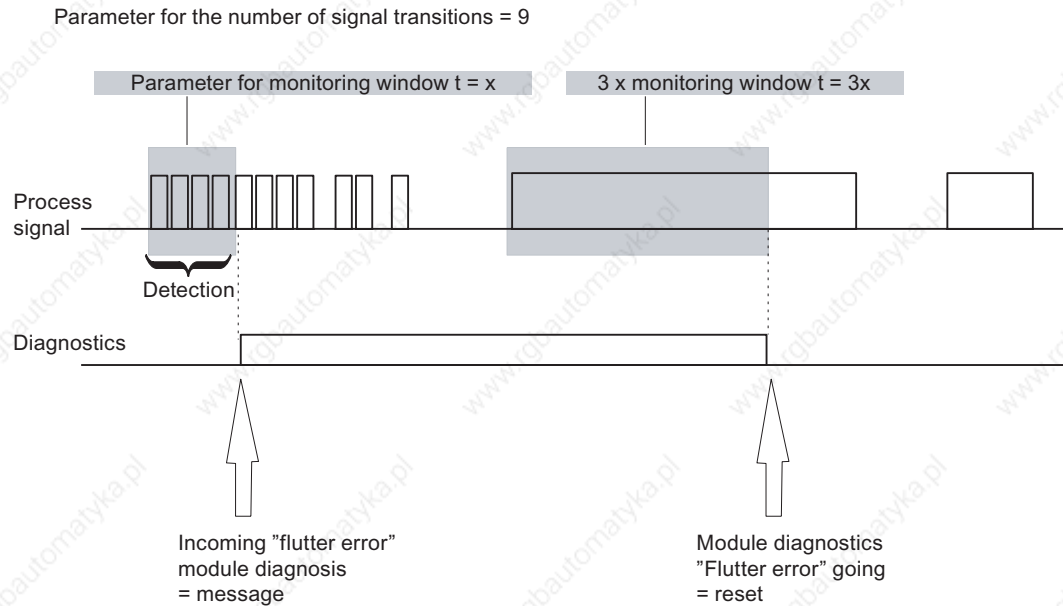


Figure 3-2 The principle of chatter monitoring

3.3 2DI 24 VDC ST digital electronic module (6ES7131-4BB01-0AA0)

Properties

- Digital electronic module with two inputs
- Nominal input voltage 24 VDC
- Suitable for switches and proximity switches (BEROs)

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

3.3 2DI 24 VDC ST digital electronic module (6ES7131-4BB01-0AA0)

| Terminal assignment for the 2DI 24 VDC ST (6ES7131-4BB01-0AA0) | | | | |
|--|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> DI_n: Input signal, channel n L+ Encoder power supply 24 VDC M: Chassis ground n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L+ | 6 | L+ | |
| 3 | M | 7 | M | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for the 2DI 24 VDC ST (6ES7131-4BB01-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> <p>* with a 4-wire connection must be connected to AUX1-terminal (A3, A4, A7, A8); AUX1 must be connected to PE via PM-E</p> |

Block diagram

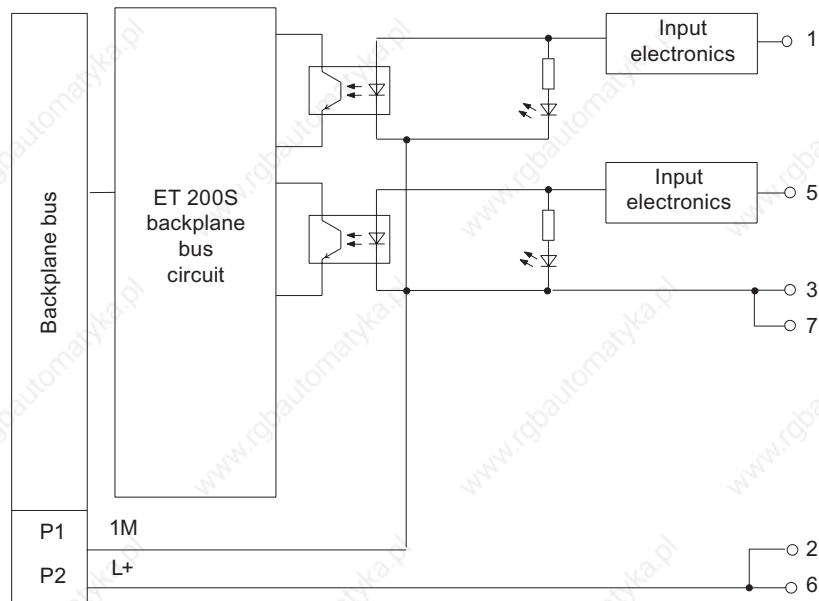


Figure 3-3 Block diagram of the 2DI 24 VDC Standard

2DI 24 VDC ST Technical Specifications (6ES7131-4BB01-0AA0).

| Dimensions and Weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 VDC |

3.3 2DI 24 VDC ST digital electronic module (6ES7131-4BB01-0AA0)

| | |
|--|--------------------------------|
| Current consumption | |
| • From supply voltage | Dependent on the sensor |
| Power dissipation of the module | Typically 0.4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Sensor supply output | |
| Output voltage | |
| • With load | min. L+ (-0.5 V) |
| Output current | |
| • Rated value | 500 mA |
| • Permitted range | 0 to 500 mA |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 24 VDC |
| • For signal "1" | 15 V to 30 V |
| • For signal "0" | -30 V to 5 V |
| Input current | |
| • At signal "1" | typ. 7 mA (for 24 V) |
| Input delay | |
| • at "0" to "1" | typ. 3 ms (2.0 to 4.5 ms) |
| • At "1" to "0" | typ. 3 ms (2.0 to 4.5 ms) |
| Input characteristic curve | according to IEC 61131, type 1 |
| Connection of two-wire BEROs | supported |
| • Permitted bias current | max. 1.5 mA |

3.4 4DI 24 VDC Standard digital electronic module (6ES7131-4BD01-0AA0).

Characteristics

- Digital electronics module with four inputs
- Nominal input voltage 24 VDC
- Suitable for switches and proximity switches (BEROs)

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for the 4DI 24 VDC Standard (6ES7131-4BD01-0AA0). | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> • DI_n: Input signal, Channel n • L+ Sensor power supply 24 VDC • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DI ₂ | 6 | DI ₃ | |
| 3 | L+ | 7 | L+ | |
| 4 | L+ | 8 | L+ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for the 4DI 24 VDC Standard (6ES7131-4BD01-0AA0). | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> <p>* connect to TM-E15x23-01 at Terminal 3 or 7</p> |

3.4 4DI 24 VDC Standard digital electronic module (6ES7131-4BD01-0AA0).

Block diagram

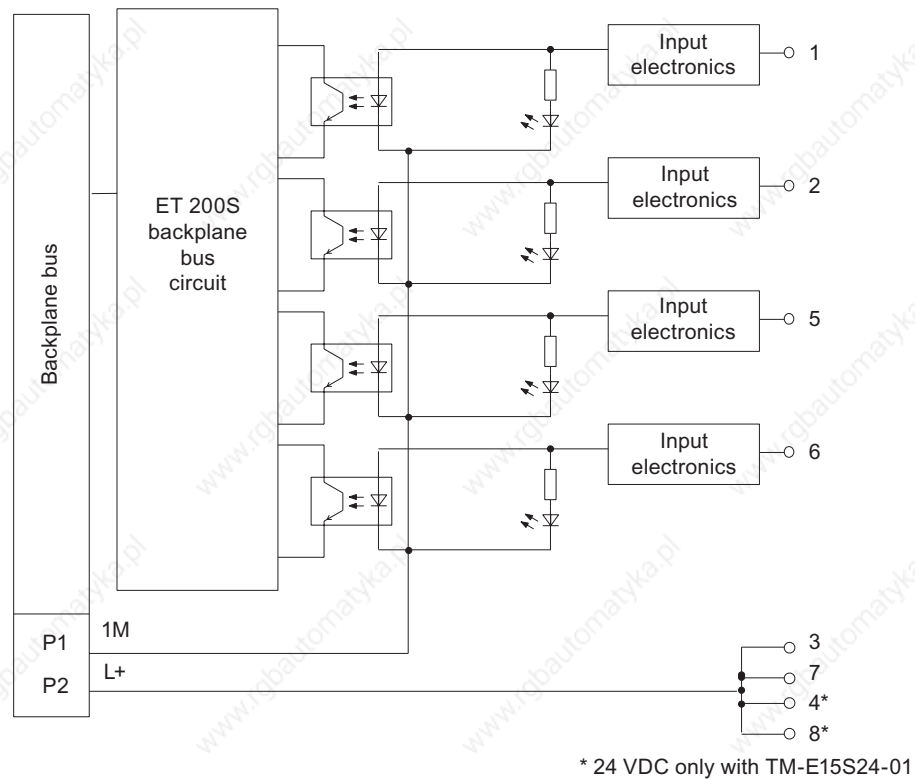


Figure 3-4 Block diagram of the 4DI 24 VDC Standard

4DI 24 VDC Standard Technical Specifications (6ES7131-4BD01-0AA0).

| Dimensions and Weight | |
|--|--------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Module-specific data | |
| Supports isochronous operation | No |
| Number of inputs | 4 |
| Cable lengths | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 byte |

| Voltages, currents, potentials | |
|--|--------------------------------|
| Rated supply voltage (from the power module) | 24 V DC |
| • Reverse battery protection | Yes |
| Electrical isolation | |
| • Between the channels | No |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 V DC |
| Current consumption | |
| • From supply voltage | Depends on sensor |
| Power dissipation of the module | Typically 0.7 W |
| Status, alarms, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | No |
| Sensor supply outputs | |
| Output voltage | |
| • With load | min. L+ (-0.5 V) |
| Output current | |
| • Rated value | 500 mA |
| • Permitted range | 0 mA to 500 mA |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 24 V DC |
| • For signal "1" | 15 to 30 V |
| • For signal "0" | -30 to 5 V |
| Input current | |
| • With "1" signal | Typically 7 mA (at 24 V) |
| Input delay | |
| • At "1" after "0" | Typically 3 ms (2.0 to 4.5 ms) |
| • At "1" after "0" | Typically 3 ms (2.0 to 4.5 ms) |
| Input characteristic curve | According to IEC 61131, Type 1 |
| Connection of 2-wire BEROs | Supported |
| • Permitted quiescent current | max. 1.5 mA |

3.5 4DI 24 VDC/SRC Standard digital electronic module (6ES7131-4BD51-0AA0)

Properties

- Digital electronics module with four inputs
- Source input
- Nominal input voltage 24 VDC
- Suitable for switches and proximity switches (BEROs)

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

Terminal assignment for the 4DI 24 VDC/SRC Standard (6ES7131-4BD51-0AA0).

| Terminal | Assignment | Terminal | Assignment | Notes |
|----------|-----------------|----------|-----------------|--|
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> • DI_n: Input signal, channel n • M: Chassis ground • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DI ₂ | 6 | DI ₃ | |
| 3 | M | 7 | M | |
| 4 | M | 8 | M | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for the 4DI 24 VDC/SRC Standard (6ES7131-4BD51-0AA0). | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> <p>* connect to TM-E15x23-01 at terminal 3 or 7</p> |

3.5 4DI 24 VDC/SRC Standard digital electronic module (6ES7131-4BD51-0AA0)

Block diagram

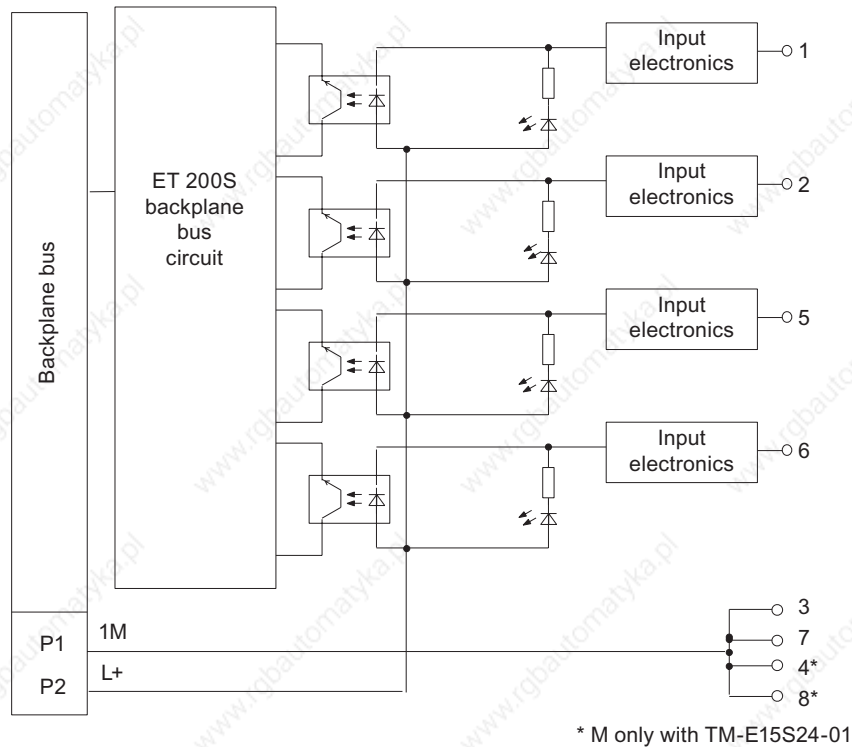


Figure 3-5 Block diagram of the 4DI 24 VDC/SRC Standard

4DI 24 VDC/SRC Standard Technical Specifications (6ES7131-4BD51-0AA0).

| Dimensions and Weight | |
|--|--------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 4 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |

3.5 4DI 24 VDC/SRC Standard digital electronic module (6ES7131-4BD51-0AA0)

| | |
|--|--------------------------------|
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • From supply voltage | Dependent on the sensor |
| Power dissipation of the module | Typically 0.7 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Sensor supply output | |
| Output voltage | |
| • With load | max. M +0.5 V |
| Output current | |
| • Rated value | 500 mA |
| • Permitted range | 0 to 500 mA |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 24 VDC |
| • For signal "1" | -15 to -30 V ¹ |
| • For signal "0" | 30 to -5 V ¹ |
| Input current | |
| • At signal "1" | typ. 7 mA (for 24 V) |
| Input delay | |
| • At "0" to "1" | typ. 3 ms (2.0 to 4.5 ms) |
| • At "1" to "0" | typ. 3 ms (2.0 to 4.5 ms) |
| Input characteristic curve | according to IEC 61131, type 1 |
| Connection of two-wire BEROs | supported |
| • Permitted bias current | max. 1.5 mA |
| ¹ Reference potential is L+ | |

3.6 2DI 24 VDC High Feature digital electronic module (6ES7131-4BB01-0AB0)

Properties

- Digital electronic module with two inputs
- Nominal input voltage 24 VDC
- Diagnostics: Short circuit
- Short-circuit protection
- Suitable for switches and proximity switches (BEROs)
- Supports isochronous operation

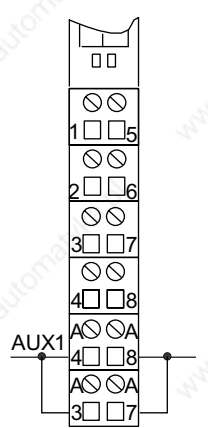
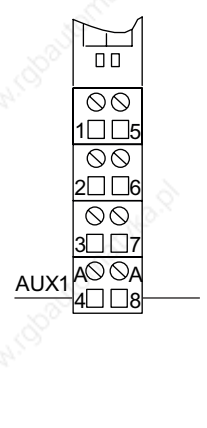
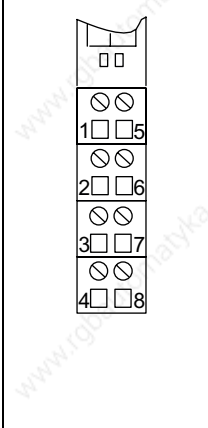
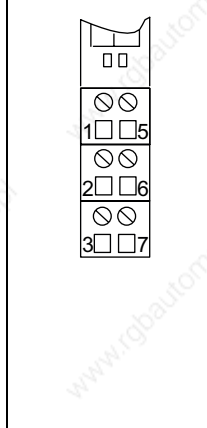
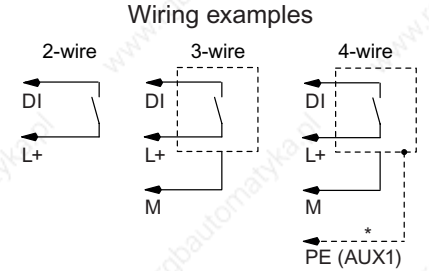
General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment of the 2DI 24 VDC High Feature (6ES7131-4BB01-0AB0) | | | | |
|---|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> • DI_n: Input signal, channel n • L+ Encoder power supply 24 VDC • M: Chassis ground • n.c.: Not connected (max. DC 30 V can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L+ | 6 | L+ | |
| 3 | M | 7 | M | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal module of the 2DI 24 VDC High Feature (6ES7131-4BB01-0AB0) | | | | |
|--|--|--|--|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Wiring examples</p>  <p>* with a 4-wire connection must be connected to AUX1-terminal (A3, A4, A7, A8); AUX1 must be connected to PE via PM-E</p> |

Block diagram

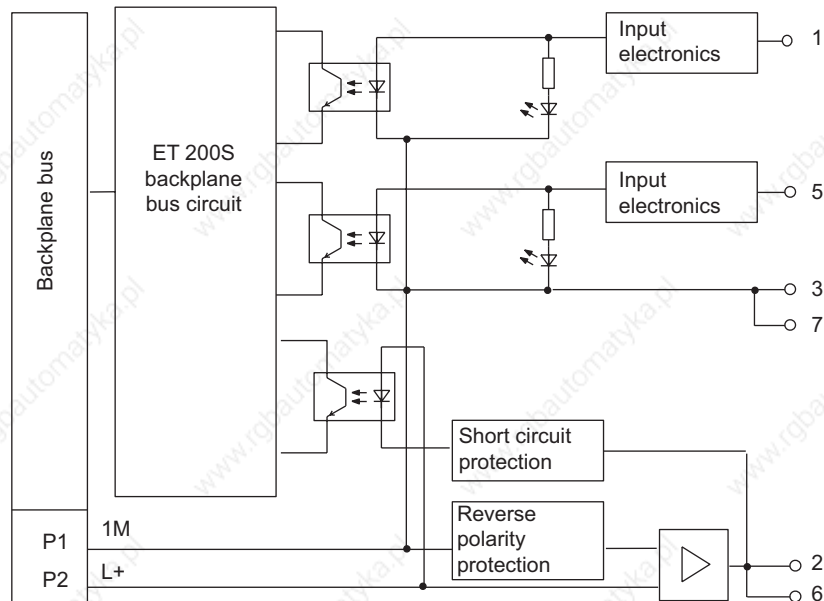


Figure 3-6 Block diagram of the 2DI 24 VDC High Feature

Technical Specifications 2DI 24 VDC High Feature (6ES7131-4BB01-0AB0)

| Dimensions and Weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of inputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 VDC |

3.6 2DI 24 VDC High Feature digital electronic module (6ES7131-4BB01-0AB0)

| | |
|---|---|
| Current consumption | |
| • From supply voltage | Dependent on the sensor |
| Power dissipation of the module | Typically 0.4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Interrupts | |
| • Hardware interrupt | Parameters can be assigned |
| Diagnostics function | |
| • General fault | Red "SF" LED |
| • Diagnostic information can be displayed | Yes |
| Sensor supply output | |
| Output voltage | |
| • With load | min. L+ (-0.5 V) |
| Output current | |
| • Rated value | 500 mA |
| • Permitted range | 0 to 500 mA |
| Short-circuit protection | Yes, electronic ¹ |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 24 VDC |
| • For signal "1" | 11 V to 30 V |
| • For signal "0" | -30 V to 5 V |
| Input current | |
| • At signal "1" | Typ. 8 mA |
| Input delay (parameters can be assigned) | |
| • At "0" to "1" | 0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms) |
| • At "1" to "0" | 0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms) |
| Input characteristic curve | according to IEC 61131, type 1 |
| Connection of two-wire BEROs | supported |
| • Permitted bias current | max. 1.5 mA |
| ¹ Per module | |

3.7 4DI 24 VDC High Feature digital electronic module (6ES7131-4BD01-0AB0)

Characteristics

- Digital electronics module with four inputs
- Nominal input voltage 24 VDC
- Diagnostics: Short circuit
- Short-circuit protection
- Suitable for switches and proximity switches (BEROs)
- Supports isochronous operation

General terminal assignment

Note

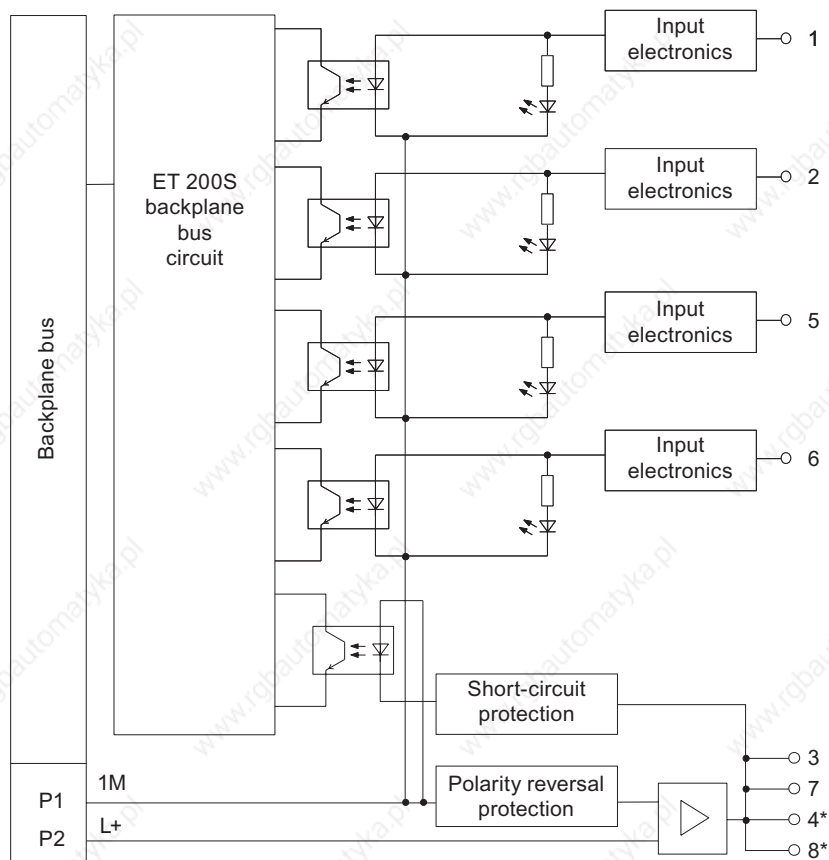
Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment of the 4DI 24 VDC High Feature (6ES7131-4BD01-0AB0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> • DI_n: Input signal, Channel n • L+ Sensor power supply 24 VDC • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DI ₂ | 6 | DI ₃ | |
| 3 | L+ | 7 | L+ | |
| 4 | L+ | 8 | L+ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules of the 4DI 24 VDC High Feature (6ES7131-4BD01-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|-----------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | |

Block diagram



* 24 VDC only with TM-E15S24-01 and TM-E15S26-A1

Figure 3-7 Block diagram of the 4DI 24 VDC High Feature

4DI 24 VDC High Feature Technical Specifications (6ES7131-4BD01-0AB0)

| Dimensions and Weight | |
|--|--------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Module-specific data | |
| Supports isochronous operation | Yes |
| Number of inputs | 4 |
| Cable lengths | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |

3.7 4DI 24 VDC High Feature digital electronic module (6ES7131-4BD01-0AB0)

| Voltages, currents, potentials | |
|--|------------------------------|
| Rated supply voltage (from the power module) | 24 V DC |
| • Reverse battery protection | Yes |
| Electrical isolation | |
| • Between the channels | No |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 V DC |
| Current consumption | |
| • From supply voltage | Depends on sensor |
| Power dissipation of the module | Typically 0.7 W |
| Status, alarms, diagnostics | |
| Status display | Green LED per channel |
| Interrupts | |
| • Process interrupt | Programmable |
| Diagnostics function | |
| • General fault | Red LED "SF" |
| • Diagnostic information can be displayed | Yes |
| Sensor supply outputs | |
| Output voltage | |
| • With load | min. L+ (-0.5 V) |
| Output current | |
| • Rated value | 500 mA |
| • Permitted range | 0 mA to 500 mA |
| Short-circuit protection | Yes, electronic ¹ |

3.8 4DI 24 VUC to 48 VUC High Feature digital electronic module (6ES7131-4CD00-0AB0)

| Data for selecting a sensor | |
|--|---|
| Input voltage | |
| • Rated value | 24 V DC |
| • For signal "1" | 11 to 30 V |
| • For signal "0" | -30 to 5 V |
| Input current | |
| • With "1" signal | Typ. 8 mA |
| Input delay (parameters can be assigned) | |
| • At "1" after "0" | 0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms) |
| • At "1" after "0" | 0.1 ms (0.05 to 0.15 ms) 0.5 ms (0.4 to 0.6 ms) 3 ms (2.7 to 3.3 ms) 15 ms (14.85 to 15.15 ms) |
| Input characteristic curve | According to IEC 61131, Type 1 |
| Connection of 2-wire BEROs | Supported |
| • Permitted quiescent current | max. 1.5 mA |
| ¹ Per module | |

3.8 4DI 24 VUC to 48 VUC High Feature digital electronic module (6ES7131-4CD00-0AB0)

Characteristics

- Digital electronics module with four inputs
- Rated input voltage 24 VAC/VDC to 48 VAC/VDC
- Diagnostics: Wire break
- Diagnostics: Fuse blown
- Diagnostics: Missing load voltage
- Suitable for switches and proximity switches (BEROs)
- Supports isochronous operation

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

3.8 4DI 24 VUC to 48 VUC High Feature digital electronic module (6ES7131-4CD00-0AB0)

| Terminal assignment of the 4DI 24 VUC to 48 VUC High Feature (6ES7131-4CD00-0AB0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> • DI_n: Input signal, Channel n • L+ Sensor power supply 24 VAC/VDC to 48 VAC/VDC • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DI ₂ | 6 | DI ₃ | |
| 3 | L+ | 7 | L+ | |
| 4 | L+ | 8 | L+ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules of the 4DI 24 VUC to 48 VUC High Feature (6ES7131-4CD00-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> <p>* connect to TM-E15x23-01 at terminal 3 or 7</p> |

3.8 4DI 24 VUC to 48 VUC High Feature digital electronic module (6ES7131-4CD00-0AB0)

Block diagram

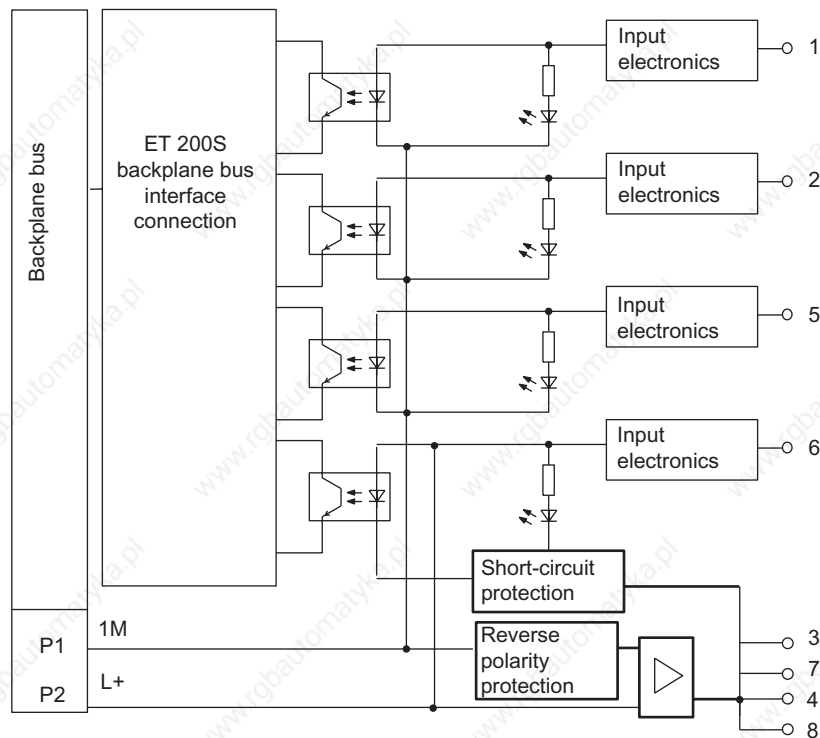


Figure 3-8 Block diagram of the 4DI 24 to 48 VUC High Feature

4DI VUC 24 to 48 VUC High Feature Technical Specifications (6ES7131-4CD00-0AB0)

| Dimensions and Weight | |
|---|--------------------------|
| Dimensions W × H × D (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 (mm) |
| Weight | Approx. 35 g |
| Module-specific data | |
| Supports isochronous operation | Yes |
| Number of inputs | 4 |
| Cable lengths | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage (from the power module) | 24 VAC/VDC to 48 VAC/VDC |
| • Horizontal installation up to 60° C | |
| • Vertical installation up to 40° C | |
| • Reverse battery protection | AC or DC automatically |

3.8 4DI 24 VUC to 48 VUC High Feature digital electronic module (6ES7131-4CD00-0AB0)

| | |
|---|--|
| Electrical isolation | |
| • Between the channels | No |
| • Between channels and backplane bus | Yes |
| Permitted potential difference | |
| • Between the different circuits | 75 VDC, 60 VAC |
| Insulation test voltage | 2500 V DC |
| Current consumption | |
| • From the power supply L+ | Depends on sensor |
| • From backplane bus | max. 10 mA |
| Power dissipation of the module | Typically 0.7 W |
| Status, alarms, diagnostics | |
| Status display | Green LEDs per channel |
| Diagnostics function | Programmable |
| • Group error display | Red LEDs (SF) |
| Sensor power supply outputs | |
| Output voltage | |
| • With load | min. L+ (-0.5 V) |
| Output current | |
| • Rated value | 500 mA |
| • Permitted range | 0 mA to 500 mA |
| Short-circuit protection | Yes, per module |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 24 to 48 VUC |
| • For signal "1" | -15 VDC to -57.6 VDC 15 VDC to 57.6 VDC 15 VAC to 48 VAC |
| • For signal "0" | -6 VDC to 6 VDC 0 VAC to 5 VAC |
| • Frequency range | 47 Hz to 63 Hz |
| Input current | |
| • With "1" signal | From 4 mA to 10 mA |
| Input delay | |
| • At "1" after "0" | max. 15 ms |
| • At "1" after "0" | max. 15 ms |
| Input characteristic curve ¹ | |
| Connection of 2-wire BEROs | Supported |
| • Permitted quiescent current | max. 0.5 to 2 mA ² |

3.9 4DI NAMUR digital electronic module (6ES7131-4RD00-0AB0)

| Sensor switching | |
|--|---------------|
| Resistance circuit of the sensor for wire break monitoring | |
| <ul style="list-style-type: none"> Nominal voltage 24 V (15 V to 35 V) | 18 k Ω |
| <ul style="list-style-type: none"> Nominal voltage 48 V (30 V to 60 V) | 39 k Ω |
| ¹ IEC 61131 does not provide technical specifications for UC modules. However, the values have been adjusted to IEC 61131 as closely as possible. | |
| ² Minimum load current is required in the case of wire-break monitoring. | |

3.9 4DI NAMUR digital electronic module (6ES7131-4RD00-0AB0)

Properties

- Digital electronics module with four inputs
- Encoder power supply 8.2 VDC
- Suitable for NAMUR sensors and both closed and open mechanical contacts

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment of the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> DI_n: Input signal, channel n V_s: Encoder power supply 8.2 VDC AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DI ₂ | 6 | DI ₃ | |
| 3 | V _s | 7 | V _s | |
| 4 | V _s | 8 | V _s | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

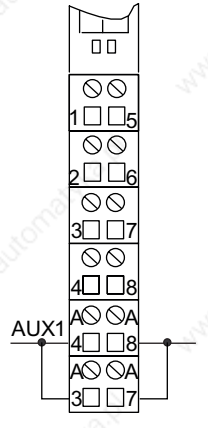
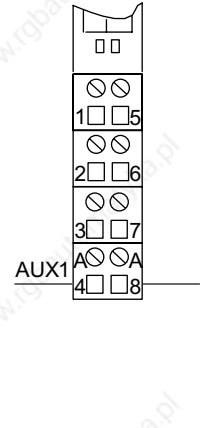
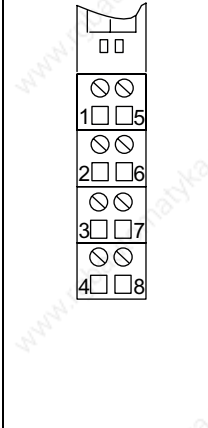
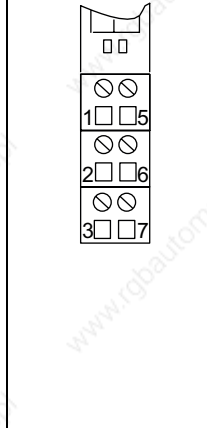
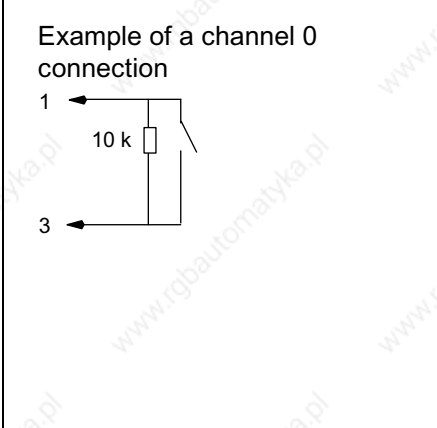
Usable terminal modules for connection of NAMUR sensors and sensors to IEC 60947-5-6

| Usable terminal modules for the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Example of a channel 0 connection</p> |

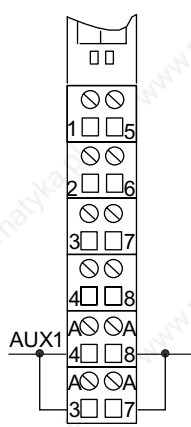
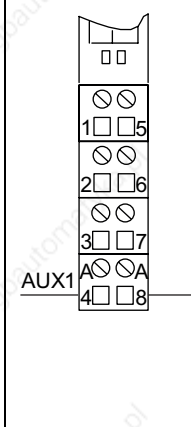
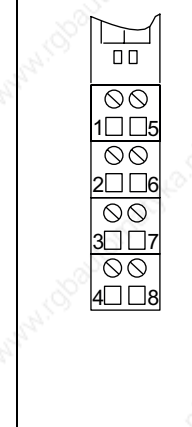
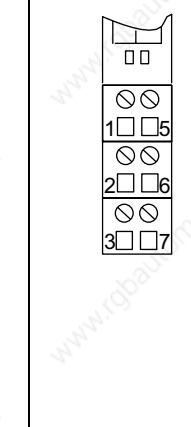
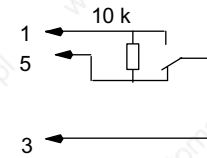
Usable terminal modules for connection of NAMUR changeover contacts and sensors to IEC 60947-5-6

| Usable terminal modules for the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Example of a channel 0 and channel 1 connection</p> |

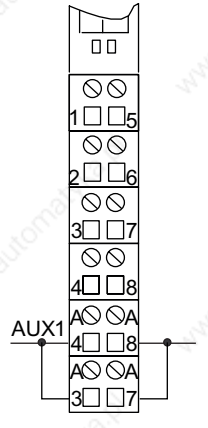
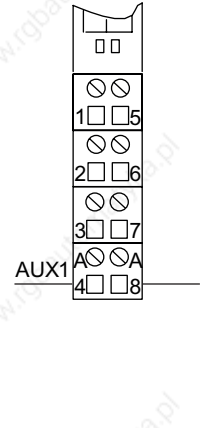
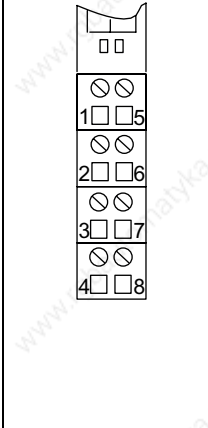
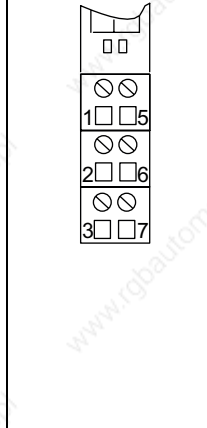
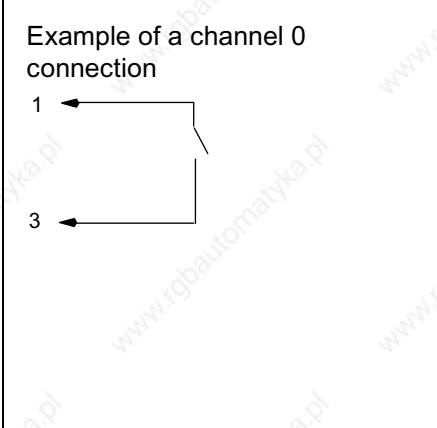
Usable terminal modules for connection of a single contact with 10 kΩ circuit (mechanical normally open contact)

| Usable terminal modules for the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|--|--|--|--|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Example of a channel 0 connection</p>  |

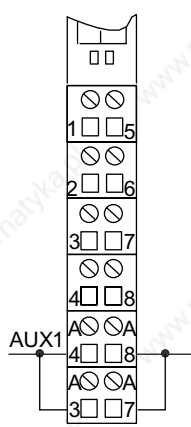
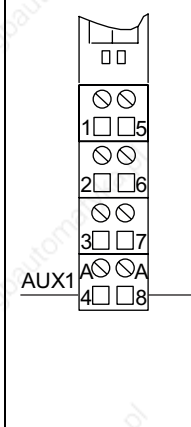
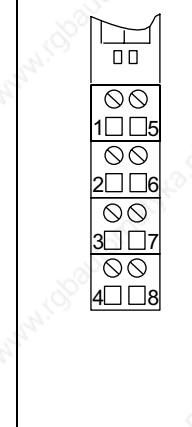
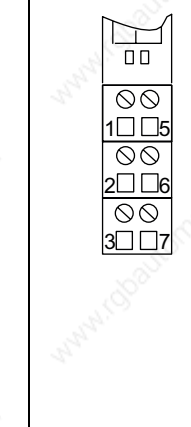
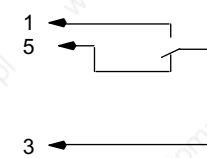
Usable terminal modules for connection of a single changeover contact with 10 kΩ circuit (mechanical changeover contact)

| Usable terminal modules for the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|--|--|--|--|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Example of a channel 0 and channel 1 connection</p>  |

Usable terminal modules for connection of a single contact, open (mechanical normally open contact with single contact)

| Usable terminal modules for the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|--|--|--|--|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Example of a channel 0 connection</p>  |

Usable terminal modules for connection of a changeover contact, open (mechanical changeover contact)

| Usable terminal modules for the 4DI NAMUR (6ES7131-4RD00-0AB0) | | | | |
|--|--|--|--|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Example of a channel 0 and channel 1 connection</p>  |

Block diagram

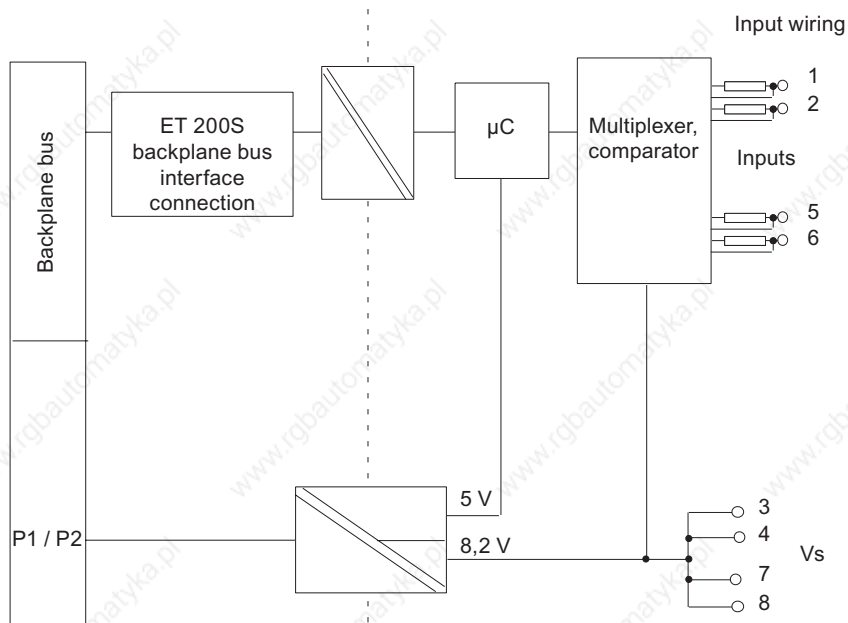


Figure 3-9 Block diagram of the 4DI NAMUR

4DI NAMUR Technical Specifications (6ES7131-4RD00-0AB0)

| Dimensions and Weight | |
|--|----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 4 |
| Cable length | |
| • Shielded | max. 200 m |
| Voltages, currents, potentials | |
| Number of inputs that can be triggered simultaneously | 4 |
| • Horizontal mounting up to 60 °C | 4 |
| • All other mounting positions up to 40° C | 4 |
| Galvanic isolation | |
| • Between the channels | no |
| • Between channels and backplane bus | Yes |
| • Between channels and load voltage | Yes |
| • Between load voltage and backplane bus | Yes |
| Permissible potential difference | |
| • Between different circuits | 75 VDC, 60 VAC |

3.9 4DI NAMUR digital electronic module (6ES7131-4RD00-0AB0)

| | |
|--|---|
| Insulation test voltage: | |
| <ul style="list-style-type: none"> Channels against the backplane bus and load voltage | 500 VDC |
| <ul style="list-style-type: none"> Load voltage against the backplane bus | 500 VDC |
| Current consumption | |
| <ul style="list-style-type: none"> From load voltage L+ | Dependent on the sensor |
| Power dissipation of the module | Typically 1.6 W |
| Parameter length | 12 bytes |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Interrupts | |
| <ul style="list-style-type: none"> Hardware interrupt Diagnostic interrupt | no Yes, can be set |
| Diagnostics function | |
| <ul style="list-style-type: none"> Group error display Diagnostic information can be displayed | Red "SF" LED supported |
| Monitoring for | |
| <ul style="list-style-type: none"> Short circuit Wire break | $I > 7 \text{ mA}^1$ $I > 0.35 \text{ mA}^1$ |
| Data for selecting a sensor | |
| Input current for NAMUR sensors | to NAMUR or EN 50227 |
| <ul style="list-style-type: none"> At signal "1" At signal "0" | 2.1 mA to 7 mA 0.35 mA to 1.2 mA |
| Input current for a closed contact | |
| <ul style="list-style-type: none"> At signal "1" For signal "0" | 2.1 mA to 7 mA 0.35 mA to 1.2 mA |
| Input current for an open contact | |
| <ul style="list-style-type: none"> At signal "1" Permitted bias current | Typ. 8 mA 0.5 mA |
| Input delay | |
| <ul style="list-style-type: none"> At "0" to "1" At "1" to "0" | max. 4.6 ms max. 4.6 ms |
| Tolerated switchover time with changeover contacts | 300 ms |
| Parallel connection of inputs | no |

| Sensor power supply outputs | |
|--|-----------------|
| Number of outputs | 1 |
| Output voltage | |
| • With load | min. 8.2 V |
| Output current | |
| • Rated value | 45 mA |
| Additional (redundant) supply | Not permitted |
| Short-circuit protection | Yes, electronic |
| ¹ Only for NAMUR sensors and closed contacts. | |

Value status

The value status provides additional binary information on a digital input signal. The value status is entered in the process input image at the same time as the signal, and it provides information on the validity of the input signal. The value status is affected by:

- Wire break check/short circuit
- Chatter monitoring
- Pulse stretching
- Validity check of changeover contact sensor types

Meaning of the value status:

- "1": Input signal is valid
- "0": Input signal is invalid

Assignment in the process input image

The data is transferred to the process image in two bytes (16 bits).

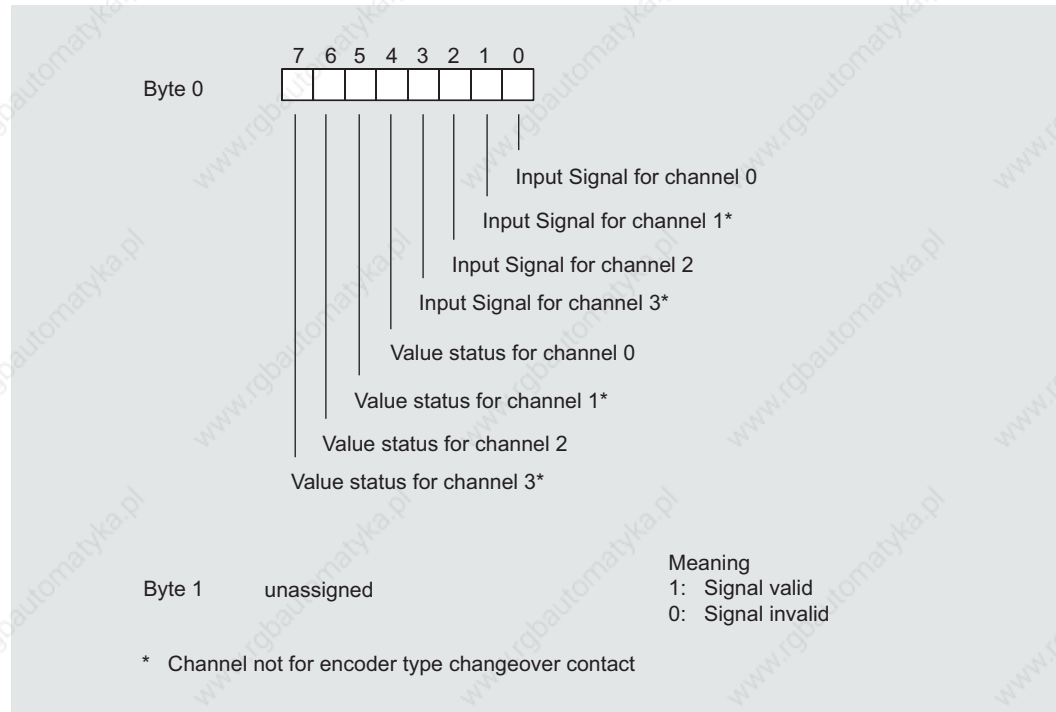


Figure 3-10 Assignment in the process input image for 4DI NAMUR

Diagnosis for changeover contact sensor types

When a diagnosis is made for the changeover contact sensor type, the digital electronic module controls the switchover between two input channels. If there is no signal change in the normally closed contact after the set switchover time (see technical specifications), the module reports a diagnosis.

Purpose of changeover contact diagnostics

You can use the diagnosis for the following:

- A diagnosis of the sensor
- To make absolutely sure that there has been a switchover between a normally open contact and normally closed contact

Principle of changeover contact diagnostics

If the digital inputs of a channel group are configured as "changeover contacts", the module for this channel group carries out a diagnostics for the changeover contact type of sensor. The tolerated changeover time between the two channels is set to the fixed value of 300 ms.

If the validity check is negative, the following applies:

- The module identifies the value status of the normally open contact channel as "invalid".
- The module creates a diagnostic entry for the NO contact channel.
- The module triggers a diagnostic interrupt.

3.10 2DI 120 VAC Standard digital electronic module (6ES7131-4EB01-0AB0)

The digital input signal and the value status are only updated for the NO contact channel (channel 0 and 2). In the case of the NC contact channel (channel 1 and 3) the digital input signal is fixed at "zero" and the value status is "invalid" because this channel is only used for a validity check of the sensor.

Note the following points when carrying out a diagnosis for a changeover contact sensor type:

- If there is already an error on the normally open contact channel (a wire break, for example), the module no longer performs diagnostics for changeover contact errors. The diagnosis for changeover contact errors continues to be carried out on the second channel.
- You will find additional points to note in the following table:

Table 3-4 Diagnosis for changeover contacts

| Changeover contact | A negative check means... | |
|-----------------------------|--|---|
| Changeover contact as NAMUR | <ul style="list-style-type: none"> • Short circuit or • Wire break | Additionally: Changeover contact error or external fault (in the case of DP diagnosis) |
| Closed changeover contact | <ul style="list-style-type: none"> • Defective sensor or short circuit No distinction can be made here between a defective sensor and short circuit | |
| Open changeover contact | Caution: No distinction possible between <ul style="list-style-type: none"> • Signal "0" and wire break • Signal "1" and short circuit | |

3.10 2DI 120 VAC Standard digital electronic module (6ES7131-4EB01-0AB0)

Properties

- Digital electronic module with two inputs
- Rated input voltage 120 VAC
- Suitable for switches

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

3.10 2DI 120 VAC Standard digital electronic module (6ES7131-4EB01-0AB0)

| Terminal assignment for 2DI 120 VAC Standard (6ES7131-4EB01-0AB0) | | | | |
|---|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> DI_n: Input signal, channel n L1: Sensor power supply 120 VAC N: Neutral conductor n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L1 | 6 | L1 | |
| 3 | N | 7 | N | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DI 120 VAC Standard (6ES7131-4EB01-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | |

Block diagram

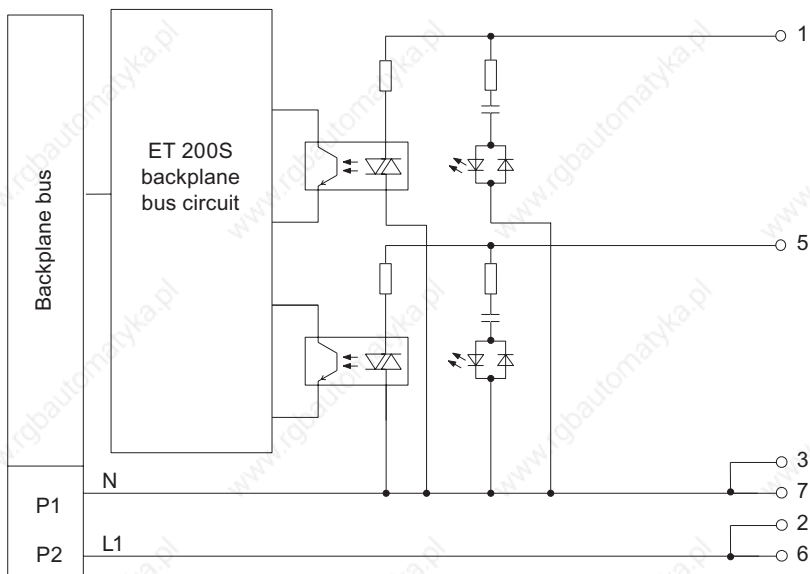


Figure 3-11 Block diagram of the 2DI 120 VAC Standard

2DI 120 VAC Standard Technical Specifications (6ES7131-4EB01-0AB0)

| Dimensions and Weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 31 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Supply voltage (from the power module) | 120 VAC |
| • Frequency | 47 to 63 Hz |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between Minternal and the inputs | 1500 VAC |
| Insulation test voltage | 2500 VDC |
| Power dissipation of the module | Typically 0.5 W |
| Status, interrupts, diagnostics | |

3.11 2DI 230 VAC Standard digital electronic module (6ES7131-4FB01-0AB0)

| | |
|------------------------------------|--------------------------------|
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 120 VAC |
| • For signal "1" | 79 VAC to 132 VAC |
| • For signal "0" | 0 to 20 VAC |
| Input current | |
| • At signal "1" | 3 to 9 mA |
| Input delay | |
| • At "0" to "1" | 15 ms |
| • At "1" to "0" | 25 ms |
| Input characteristic curve | according to IEC 61131, type 1 |
| Connection of two-wire BEROs | no |
| • Permitted bias current | max. 1 mA |

3.11 2DI 230 VAC Standard digital electronic module (6ES7131-4FB01-0AB0)

Properties

- Digital electronic module with two inputs
- Rated input voltage 230 VAC
- Suitable for switches

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

3.11 2DI 230 VAC Standard digital electronic module (6ES7131-4FB01-0AB0)

| Terminal assignment for 2DI 230 VAC Standard (6ES7131-4FB01-0AB0) | | | | |
|---|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none"> DI_n: Input signal, channel n L1: Sensor power supply 230 VAC N: Neutral conductor n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L1 | 6 | L1 | |
| 3 | N | 7 | N | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DI 230 VAC Standard (6ES7131-4FB01-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

Block diagram

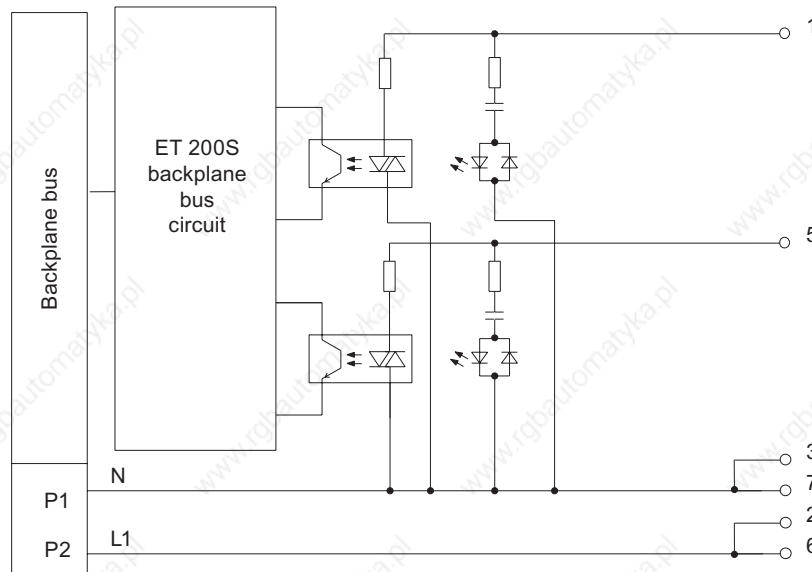


Figure 3-12 Block diagram of the 2DI 230 VAC Standard

2DI 230 VAC Standard Technical Specifications (6ES7131-4FB01-0AB0)

| Dimensions and Weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 31 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Supply voltage (from the power module) | 230 VAC |
| • Frequency | 47 to 63 Hz |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between Minternal and the inputs | 1500 VAC |
| Insulation test voltage | 4000 VDC |
| Power dissipation of the module | Typically 0.7 W |

3.12 2DO 24 VDC/0.5 A Standard digital electronic module (6ES7132-4BB01-0AA0)

| | |
|------------------------------------|--------------------------------|
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 230 VAC |
| • For signal "1" | 164 to 264 VAC |
| • For signal "0" | 0 to 40 V AC |
| Input current | |
| • At signal "1" | 5 to 15 mA |
| Input delay | |
| • at "0" to "1" | 15 ms |
| • At "1" to "0" | 45 ms |
| Input characteristic curve | according to IEC 61131, type 1 |
| Connection of two-wire BEROs | no |
| • Permitted bias current | max. 2 mA |

3.12 2DO 24 VDC/0.5 A Standard digital electronic module (6ES7132-4BB01-0AA0)

Properties

- Digital electronic module with two outputs
- Output current 0.5 A per output
- Rated load voltage 24 VDC
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights

Peculiarity

When you connect the 24 VDC rated load voltage to the power module by means of a mechanical contact, depending on the circuit the digital outputs carry the "1" signal for approximately 50 µs. You need to take this into account if you connect the module to fast counters.

3.12 2DO 24 VDC/0.5 A Standard digital electronic module (6ES7132-4BB01-0AA0)

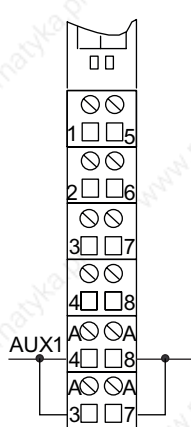
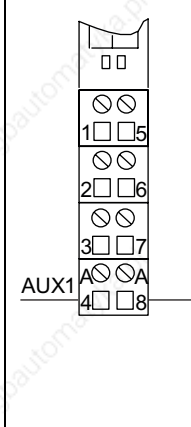
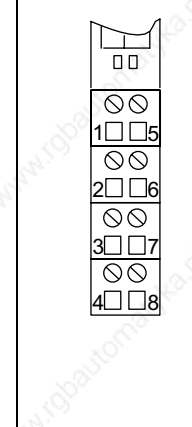
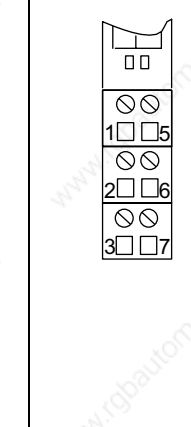
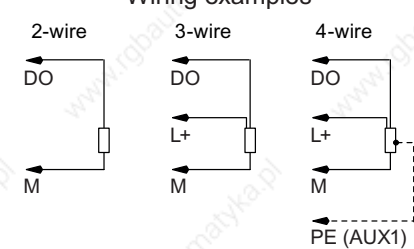
General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2DO 24 VDC/0.5 A Standard (6ES7132-4BB01-0AA0) | | | | |
|--|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> DO_n: Output signal, channel n L+ Rated load voltage 24 VDC M: Chassis ground n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L+ | 6 | L+ | |
| 3 | M | 7 | M | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DO 24 VDC/0.5 A Standard (6ES7132-4BB01-0AA0) | | | | |
|---|---|---|---|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Wiring examples</p>  |

Block diagram

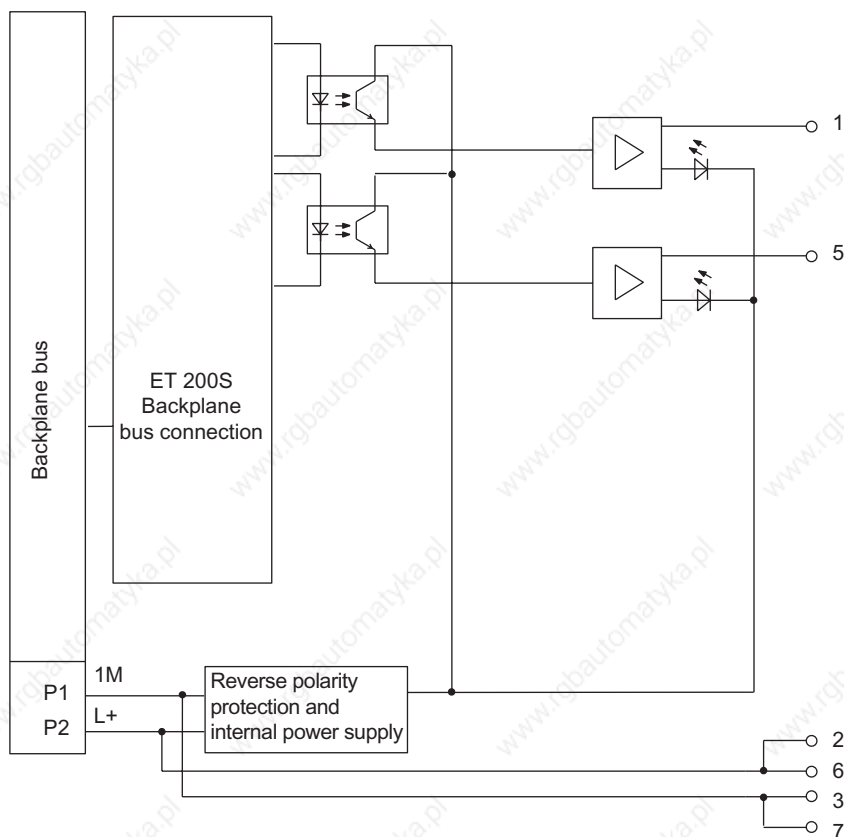


Figure 3-13 Block diagram of the 2DO 24 VDC/0.5 A Standard

2DO 24 VDC/0.5 A Standard Technical Specifications (6ES7132-4BB01-0AA0)

| Dimensions and Weight | |
|--|------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 byte |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes ¹ |
| Total current of the outputs (per module) | 1 A |

3.12 2DO 24 VDC/0.5 A Standard digital electronic module (6ES7132-4BB01-0AA0)

| | |
|---|--|
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the load voltage L+ (no load) | max. 5 mA per channel |
| Power dissipation of the module | Typically 0.4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 0.5 A |
| – Permitted range | 7 mA to 0.6 A |
| • With signal "0" (leakage current) | max. 0.3 mA |
| Output delay (for resistive load) | |
| • At "0" to "1" | max. 200 μ s |
| • At "1" to "0" | max. 1.3 ms |
| Load resistor range | 48 Ω to 3.4 k Ω |
| Lamp load | max. 5 W |
| Connecting two outputs in parallel | |
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 100 Hz |
| • On inductive load | 2 Hz |
| • For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module |
| Short-circuit protection of the output | Yes ² |
| • Threshold on | Typ. 0.7 A to 1.8 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² Per channel | |

3.13 Standard digital electronic module 4DO 24 VDC/0.5 A (6ES7132-4BD01-0AA0)

Properties

- Digital electronic module with four outputs
- Output current 0.5 A per output
- Rated load voltage 24 VDC
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights

Peculiarity

When you connect the 24 VDC rated load voltage to the power module by means of a mechanical contact, depending on the circuit the digital outputs carry the "1" signal for approximately 50 µs. You need to take this into account if you connect the module to fast counters.

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 4DO 24 VDC/0.5 A Standard (6ES7132-4BD01-0AA0) | | | | |
|--|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> • DO_n: Output signal, channel n • M: Chassis ground • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DO ₂ | 6 | DO ₃ | |
| 3 | M | 7 | M | |
| 4 | M | 8 | M | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

3.13 Standard digital electronic module 4DO 24 VDC/0.5 A (6ES7132-4BD01-0AA0)

Usable terminal modules

| Usable terminal modules for 4DO 24 VDC/0.5 A Standard (6ES7132-4BD01-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| <p>Wiring examples</p> <p>2-wire</p> <p>DO</p> <p>DO</p> <p>M</p> <p>PE (AUX1)</p> | | | | |

Block diagram

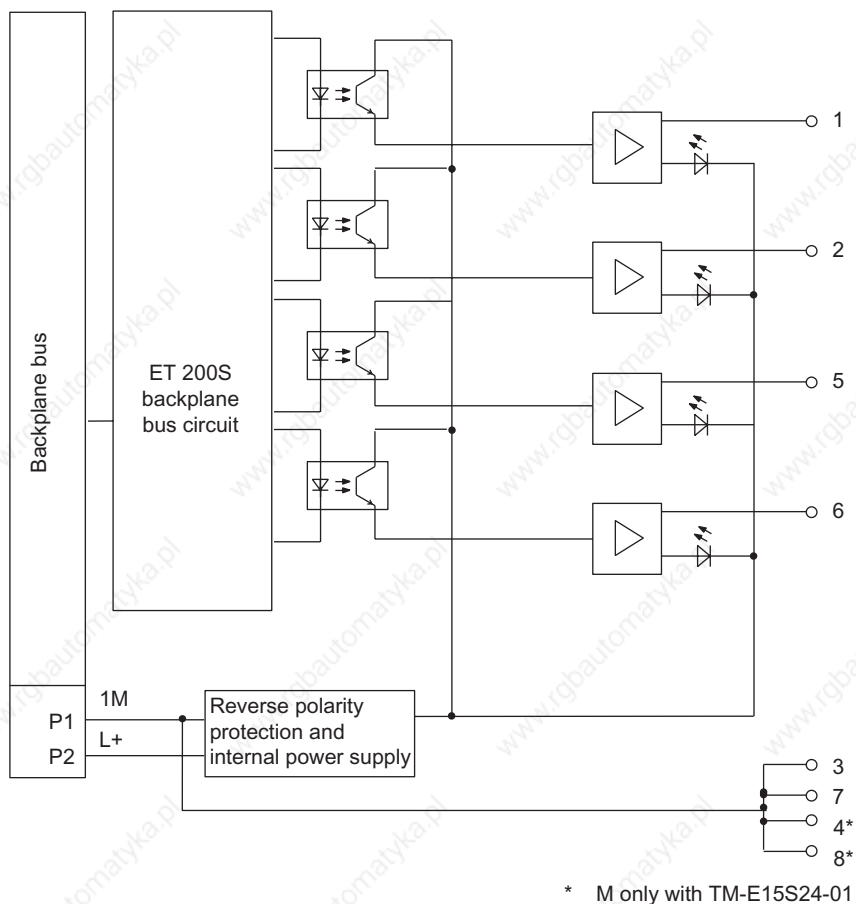


Figure 3-14 Block diagram of the 4DO 24 VDC/0.5 A Standard

Technical Specifications 4DO 24 VDC/0.5 A Standard (6ES7132-4BD01-0AA0)

| Dimensions and Weight | |
|--|-----------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of outputs | 4 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 byte |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes ¹ |
| Total current of the outputs (per module) | 2 A |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the load voltage L+ (no load) | max. 5 mA per channel |
| Power dissipation of the module | Typically 0.8 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 0.5 A |
| – Permitted range | 7 mA to 0.6 A |
| • With signal "0" (leakage current) | max. 0.3 mA |
| Output delay (for resistive load) | |
| • at "0" to "1" | max. 100 μs |
| • At "1" to "0" | max. 300 μs |
| Load resistor range | 48 Ω to 3.4 kΩ |
| Lamp load | max. 5 W |
| Connecting two outputs in parallel | |

3.14 2DO 24 VDC/0.5 A High Feature digital electronic module (6ES7132-4BB01-0AB0)

| | |
|---|---|
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 100 Hz |
| • On inductive load | 2 Hz |
| • For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module ² |
| Short-circuit protection of the output | Yes ³ |
| • Threshold on | Typ. 0.7 A to 1.5 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² The module must be supplied with voltage. | |
| ³ Per channel | |

3.14 2DO 24 VDC/0.5 A High Feature digital electronic module (6ES7132-4BB01-0AB0)

Properties

- Digital electronic module with two outputs
- Output current 0.5 A per output
- Rated load voltage 24 VDC
- Diagnostics: Wire break
- Diagnostics: Short circuit
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights
- Supports isochronous operation

Peculiarity

When you connect the 24 VDC rated load voltage to the power module by means of a mechanical contact, depending on the circuit the digital outputs carry the "1" signal for approximately 50 μs. You need to take this into account if you connect the module to fast counters.

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2DO 24 VDC/0.5 A High Feature (6ES7132-4BB01-0AA0) | | | | |
|--|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> DO_n: Output signal, channel n L+ Rated load voltage 24 VDC M: Ground n.c.: Not connected (max. 30 VDC can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L+ | 6 | L+ | |
| 3 | M | 7 | M | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DO 24 VDC/0.5 A High Feature (6ES7132-4BB01-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | |

Block diagram

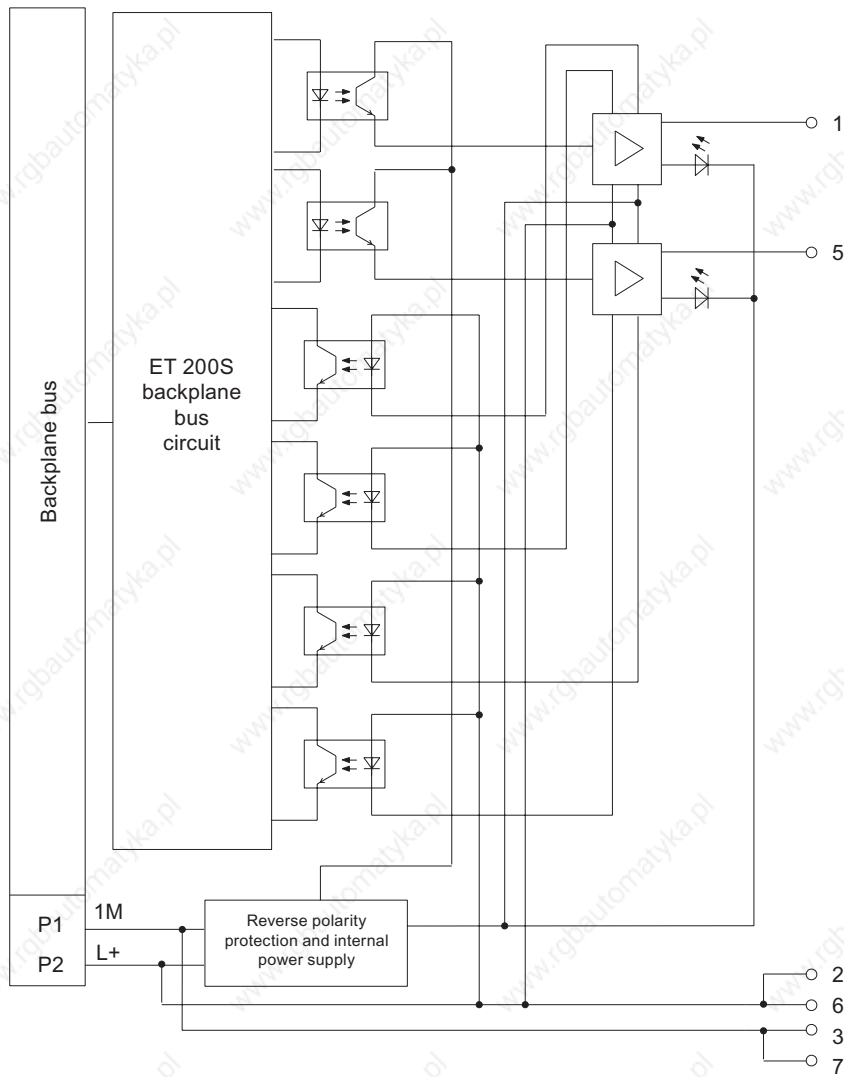


Figure 3-15 Block diagram of the 2DO 24 VDC/0.5 A High Feature

2DO 24 VDC/0.5 A High Feature Technical Specifications (6ES7132-4BB01-0AB0)

| Dimensions and Weight | |
|--|-----------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes ¹ |
| Total current of the outputs (per module) | 1 A |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the load voltage L+ (no load) | max. 5 mA per channel |
| Power dissipation of the module | Typically 0.4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 0.5 A |
| – Permitted range | 7 mA to 0.6 A |
| • With signal "0" (leakage current) | max. 0.3 mA |
| Output delay (for resistive load) | |
| • at "0" to "1" | max. 100 μs |
| • At "1" to "0" | max. 400 μs |
| Load resistor range | 48 Ω to 3.4 kΩ |

3.15 2DO 24 VDC/2 A Standard digital electronic module (6ES7132-4BB31-0AA0)

| | |
|---|--|
| Lamp load | max. 2.5 W |
| Connecting two outputs in parallel | |
| <ul style="list-style-type: none"> For redundant triggering of a load | Yes (per module) |
| <ul style="list-style-type: none"> To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| <ul style="list-style-type: none"> For resistive load | 100 Hz |
| <ul style="list-style-type: none"> On inductive load | 2 Hz |
| <ul style="list-style-type: none"> For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 V to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module |
| Short-circuit protection of the output | Yes ² |
| <ul style="list-style-type: none"> Threshold on | Typically 1.5 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² Per channel | |

3.15 2DO 24 VDC/2 A Standard digital electronic module (6ES7132-4BB31-0AA0)

Properties

- Digital electronic module with two outputs
- Output current 2 A per output
- Rated load voltage 24 VDC
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights

Peculiarity

When you connect the 24 VDC rated load voltage to the power module by means of a mechanical contact, depending on the circuit the digital outputs carry the "1" signal for approximately 50 µs. You need to take this into account if you connect the module to fast counters.

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2DO 24 VDC/2 A Standard (6ES7132-4BB31-0AA0) | | | | |
|--|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> DO_n: Output signal, channel n L+ Rated load voltage 24 VDC M: Ground n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L+ | 6 | L+ | |
| 3 | M | 7 | M | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DO 24 VDC/2 A Standard (6ES7132-4BB31-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | |

Block diagram

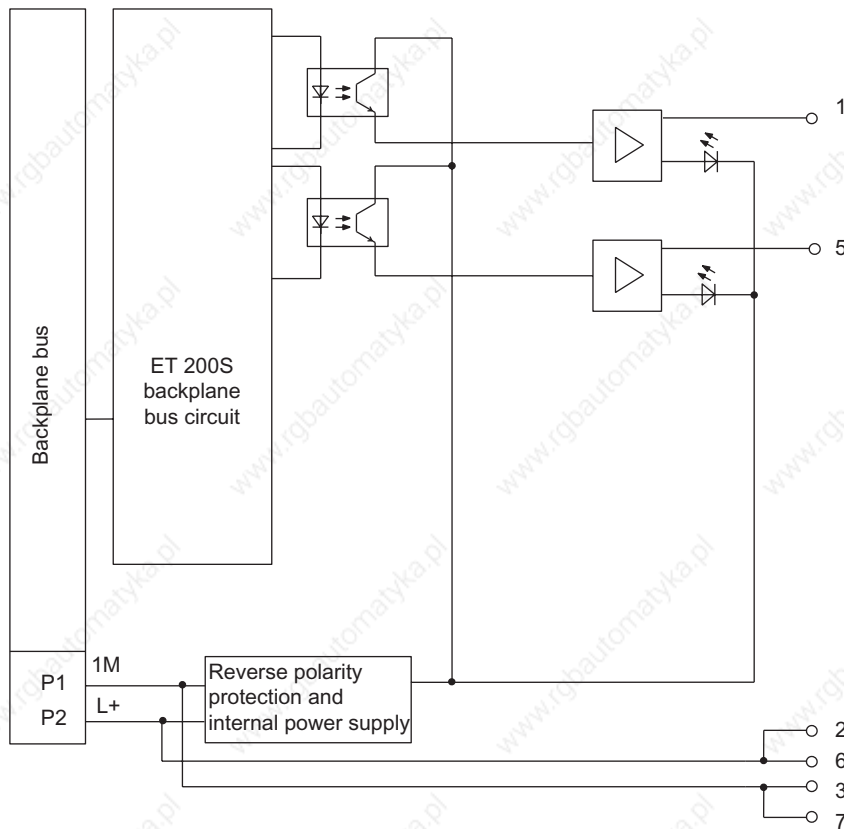


Figure 3-16 Block diagram of the 2DO 24 VDC/2 A Standard

2DO 24 VDC/2 A Standard Technical Specifications (6ES7132-4BB31-0AA0)

| Dimensions and Weight | |
|--|------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 byte |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Polarity reversal | Yes ¹ |
| Total current of the outputs (per module) | 4 A |

3.15 2DO 24 VDC/2 A Standard digital electronic module (6ES7132-4BB31-0AA0)

| | |
|---|--|
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the rated load voltage L+ (no load) | max. 5 mA per channel |
| Power dissipation of the module | Typically 1.4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 2 A |
| – Permitted range | 7 mA to 2.4 A |
| • With signal "0" (leakage current) | max. 0.5 mA |
| Output delay (for resistive load) | |
| • at "0" to "1" | max. 200 μ s |
| • At "1" to "0" | max. 1.3 ms |
| Load resistor range | 12 Ω to 3.4 k Ω |
| Lamp load | max. 10 W |
| Connecting two outputs in parallel | |
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 100 Hz |
| • On inductive load | 2 Hz (0.5 H) |
| • For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 V to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module |
| Short-circuit protection of the output | Yes ² |
| • Threshold on | Typically 2.8 A to 7.2 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² Per channel | |

3.16 4DO 24 VDC/2 A Standard digital electronic module (6ES7132-4BD31-0AA0)

Properties

- Digital electronic module with four outputs
- Output current 2 A per output
- Rated load voltage 24 VDC
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights

Peculiarity

When you connect the 24 VDC rated load voltage to the power module by means of a mechanical contact, depending on the circuit the digital outputs carry the "1" signal for approximately 50 µs. You need to take this into account if you connect the module to fast counters.

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 4DO 24 VDC/2 A Standard (6ES7132-4BD31-0AA0) | | | | |
|--|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> • DO_n: Output signal, channel n • M: Ground • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | DO ₂ | 6 | DO ₃ | |
| 3 | M | 7 | M | |
| 4 | M | 8 | M | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 4DO 24 VDC/2 A Standard (6ES7132-4BD31-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| <p style="text-align: center;">Wiring examples</p> | | | | |

Block diagram

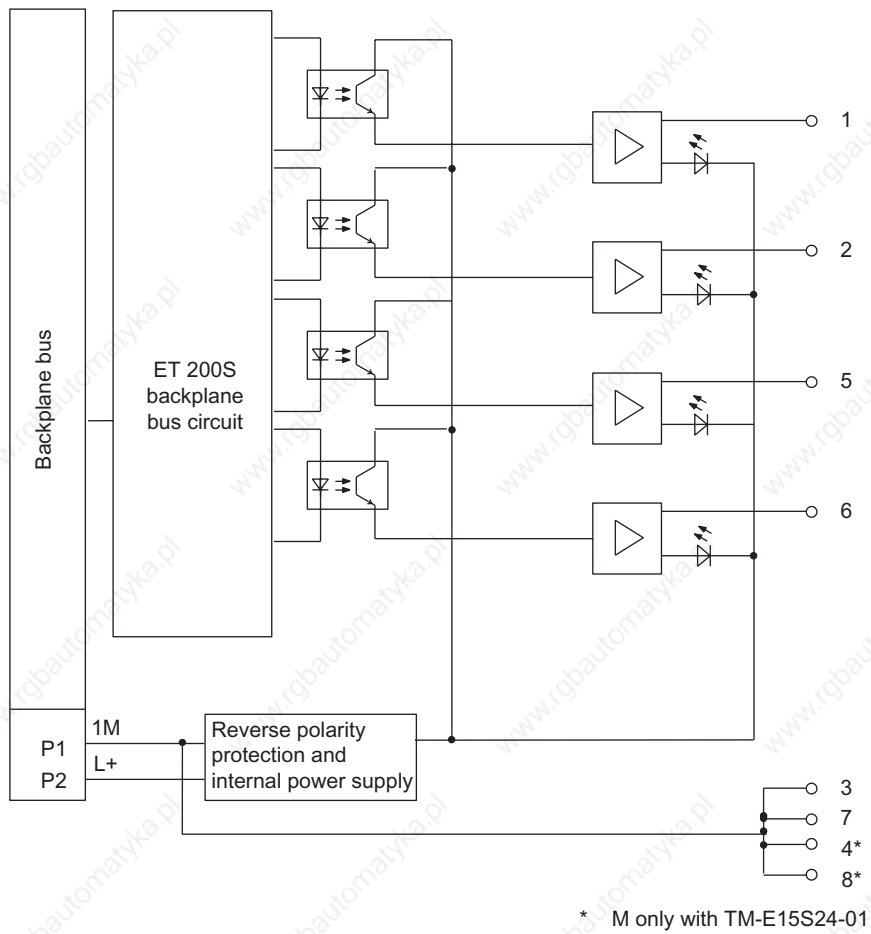


Figure 3-17 Block diagram of the 4DO 24 VDC/2 A Standard

4DO 24 VDC/2 A Standard Technical Specifications (6ES7132-4BD31-0AA0)

| Dimensions and Weight | |
|--|-----------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 4 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 1 byte |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Polarity reversal | Yes ¹ |
| Total current of the outputs (per module) | 4 A |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the rated load voltage L+ (no load) | max. 5 mA per channel |
| Power dissipation of the module | Typically 1.6 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 2 A |
| – Permitted range | 7 mA to 2.4 A |
| • With signal "0" (leakage current) | max. 0.5 mA |
| Output delay (for resistive load) | |
| • at "0" to "1" | max. 200 μs |
| • At "1" to "0" | max. 1.3 ms |
| Load resistor range | 12 Ω to 3.4 kΩ |
| Lamp load | max. 10 W |
| Connecting two outputs in parallel | |

3.17 2DO 24 VDC/2 A High Feature digital electronic module (6ES7132-4BB31-0AB0)

| | |
|---|--|
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 100 Hz |
| • On inductive load | 2 Hz (0.5 H) |
| • For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module |
| Short-circuit protection of the output | Yes ² |
| • Threshold on | Typically 2.8 A to 7.2 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² Per channel | |

3.17 2DO 24 VDC/2 A High Feature digital electronic module (6ES7132-4BB31-0AB0)

Properties

- Digital electronic module with two outputs
- Output current 2 A per output
- Rated load voltage 24 VDC
- Diagnostics: Wire break
- Diagnostics: Short circuit
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights
- Supports isochronous operation

Peculiarity

When you connect the 24 VDC rated load voltage to the power module by means of a mechanical contact, depending on the circuit the digital outputs carry the "1" signal for approximately 50 µs. You need to take this into account if you connect the module to fast counters.

General terminal assignment

3.17 2DO 24 VDC/2 A High Feature digital electronic module (6ES7132-4BB31-0AB0)

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2DO 24 VDC/2 A High Feature (6ES7132-4BB31-0AA0) | | | | |
|--|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> DO_n: Output signal, channel n L+ Rated load voltage 24 VDC M: Chassis ground n.c.: Not connected (max. 30 VDC can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | L+ | 6 | L+ | |
| 3 | M | 7 | M | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DO 24 VDC/2 A High Feature (6ES7132-4BB31-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|-------------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

Block diagram

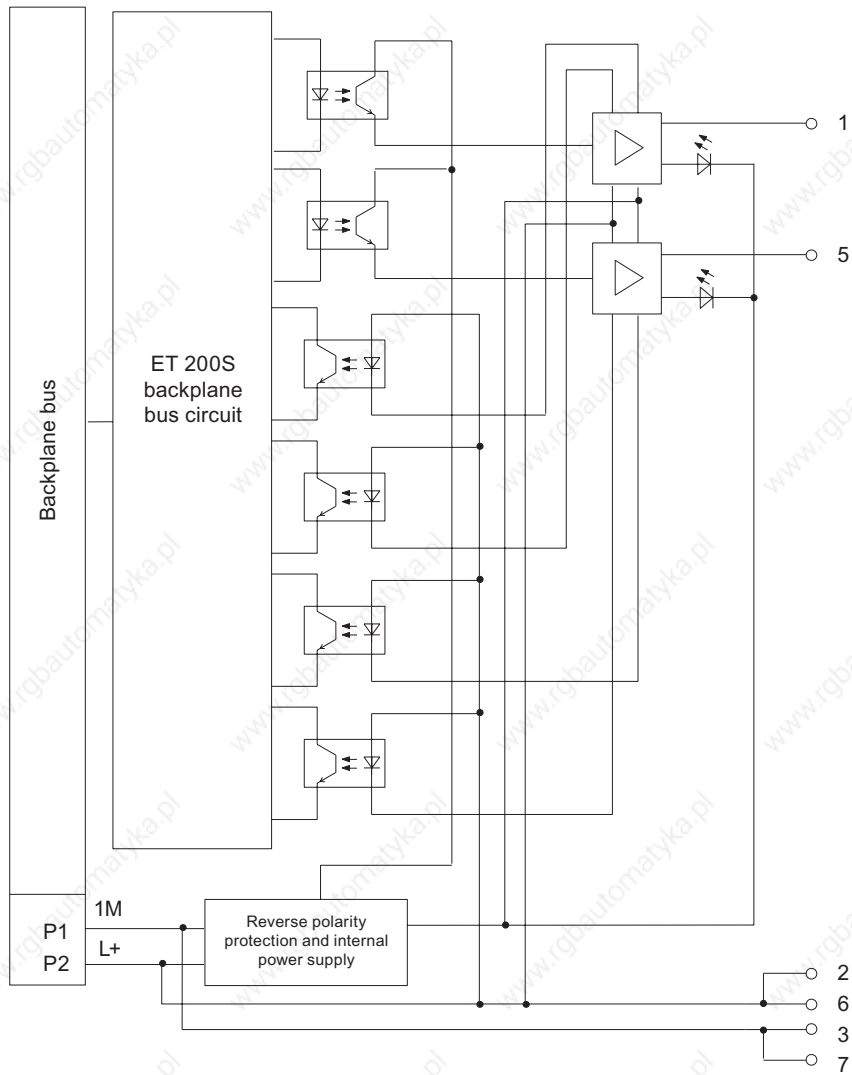


Figure 3-18 Block diagram of the 2DO 24 VDC/2 A High Feature

2DO 24 VDC/2 A High Feature Technical Specifications (6ES7132-4BB31-0AB0)

| Dimensions and Weight | |
|--|-----------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Polarity reversal | Yes ¹ |
| Total current of the outputs (per module) | 4 A |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the rated load voltage L+ (no load) | max. 5 mA per channel |
| Power dissipation of the module | Typically 1.4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | |
| • General fault | Red "SF" LED |
| • Diagnostic functions readable | Yes |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 2 A |
| – Permitted range | 7 mA to 2.4 A |
| • With signal "0" (leakage current) | max. 0.5 mA |
| Output delay (for resistive load) | |
| • at "0" to "1" | max. 100 μs |
| • At "1" to "0" | max. 400 μs |
| Load resistor range | 12 Ω to 3.4 kΩ |

3.18 2DO 24 VAC to 230 VAC digital electronic module (6ES7132-4FB01-0AB0)

| | |
|---|--|
| Lamp load | max. 5 W |
| Connecting two outputs in parallel | |
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 100 Hz |
| • On inductive load | 2 Hz (0.5 H) |
| • For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module |
| Short-circuit protection of the output | Yes ² |
| • Threshold on | Typically 4 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² Per channel | |

3.18 2DO 24 VAC to 230 VAC digital electronic module (6ES7132-4FB01-0AB0)

Properties

- Digital electronic module with two outputs
- Output current 2 A per output
- Rated load voltage 24 VAC to 48/120/230 VAC
- Replacement value
- Suitable for solenoid valves, AC contactors, and indicator lights

General terminal assignment

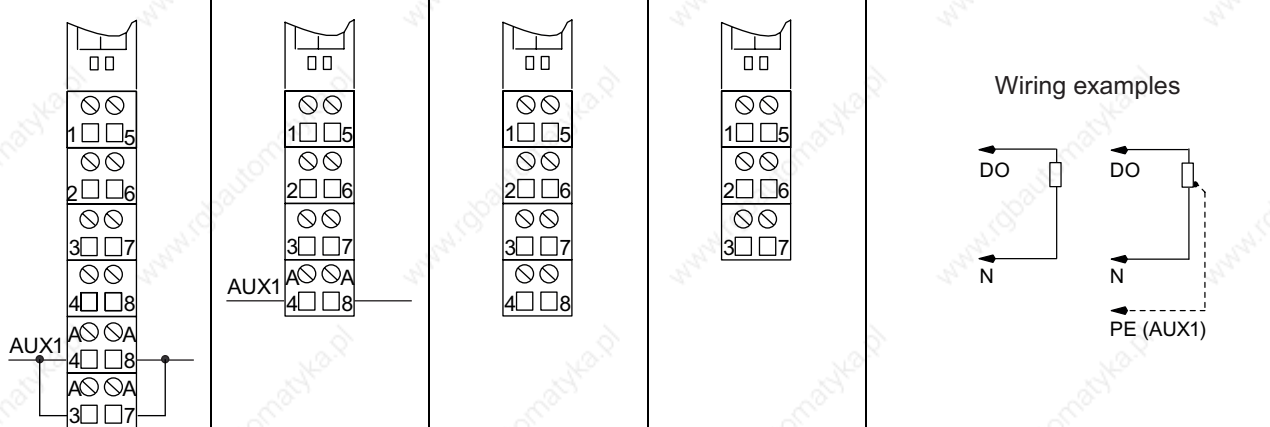
Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

3.18 2DO 24 VAC to 230 VAC digital electronic module (6ES7132-4FB01-0AB0)

| Terminal assignment for 2DO 24 VAC to 230 VAC (6ES7132-4FB01-0AB0) | | | | |
|--|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> DO_n: Output signal, channel n N: Neutral conductor n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | n.c. | 6 | n.c. | |
| 3 | N | 7 | N | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2DO 24 VAC to 230 VAC (6ES7132-4FB01-0AB0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  | | | | |

Block diagram

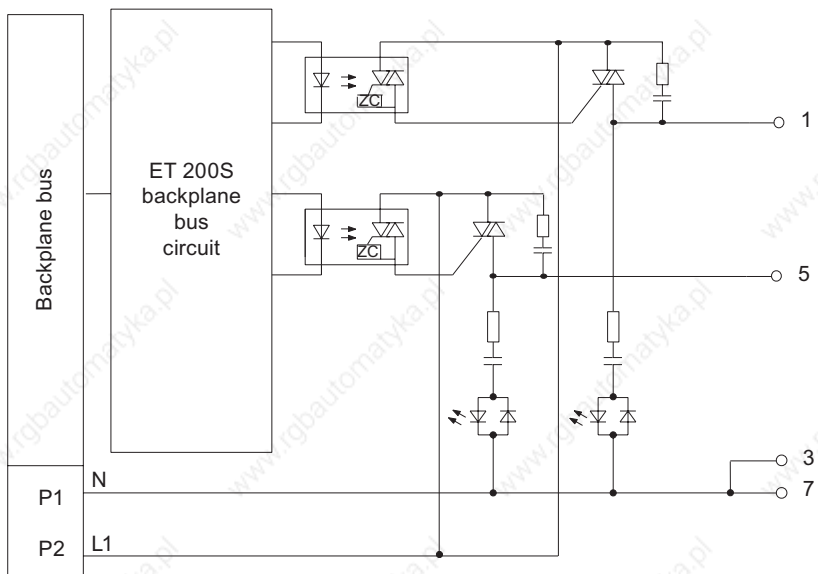


Figure 3-19 Block diagram of the 2DO 24-230 VAC

2DO 24 VAC to 230 VAC Technical Specifications (6ES7132-4FB01-0AB0)

| Dimensions and Weight | |
|--|-----------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 37 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L1 (from the power module) | 24 to 230 VAC |
| • Frequency | 47 to 63 Hz |
| Total current of the outputs (per module) | |
| • Up to 40° C | max. 2 A ¹ |
| • Up to 60° C | max. 1 A ¹ |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Insulation tested | 2500 VDC |

3.18 2DO 24 VAC to 230 VAC digital electronic module (6ES7132-4FB01-0AB0)

| | |
|---|---|
| Current consumption | |
| • From the backplane bus | max. 18 mA |
| • From rated load voltage L1 (no load) | max. 15 mA per channel |
| Power dissipation of the module | max. 4 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | min. L (-1.5 V) |
| Output current (per channel) | |
| • At signal "1" | |
| – Rated value | 2 A |
| – Permitted range | 0.1 mA to 2.2 A |
| • With signal "0" (leakage current) | max. 3 mA |
| Output delay (for resistive load) | |
| • at "0" to "1" | max. 15 ms |
| • At "1" to "0" | max. 15 ms |
| Zero cross inhibit voltage | max. 25 V |
| Motor starter size | |
| • Up to 40° C | Max. size in accordance with NEMA: 5 |
| • Up to 60° C | Max. size in accordance with NEMA: 4 |
| Lamp load | max. 100 W |
| Connecting two outputs in parallel | |
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | no |
| Control of a digital input | supported |
| Switch rate | |
| • For resistive load | max. 10 Hz |
| • On inductive load | max. 0.5 Hz |
| • For lamp load | max. 1 Hz |
| Short-circuit protection of the output | Yes, by means of fuse in the power module |
| ¹ Total current of the outputs (per module): see the diagram below | |

Total current of the outputs

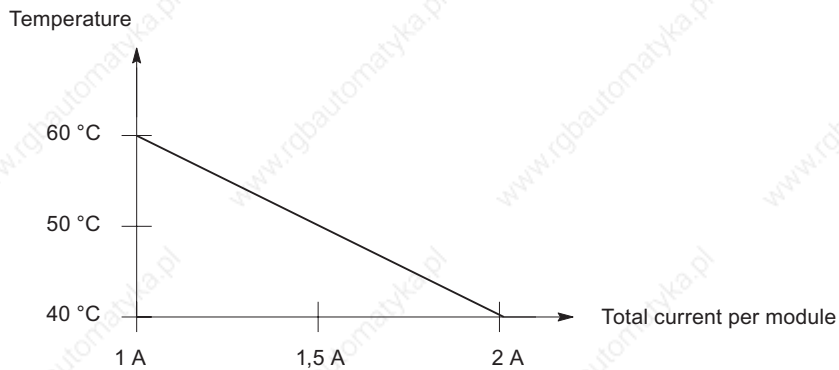


Figure 3-20 Total current of the outputs for 2DO 24 VAC to 230 VAC

3.19 2RO NO 24 VDC to 120 VDC/5 A, 24 VDC to 230 VAC/5 A digital electronic module (6ES7132-4HB01-0AB0)

Properties

- Digital electronic module with two relay outputs
- Output current 5 A per output
- Rated load voltage DC up to 120 V / AC to 230 V
- suitable for solenoid valves, DC contactors, and indicator lights
- Isolated from the supply voltage



Caution

The rated power supply voltage of the 2RO NO 24 VDC to 120 VDC/5 A, 24 VAC to 230 VAC/5 A is 24 VDC. The 2RO NO 24 VDC to 120 VDC/5 A, 24 VAC to 230 VAC/5 A must be in a 24 VDC potential group only (from the power module).

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

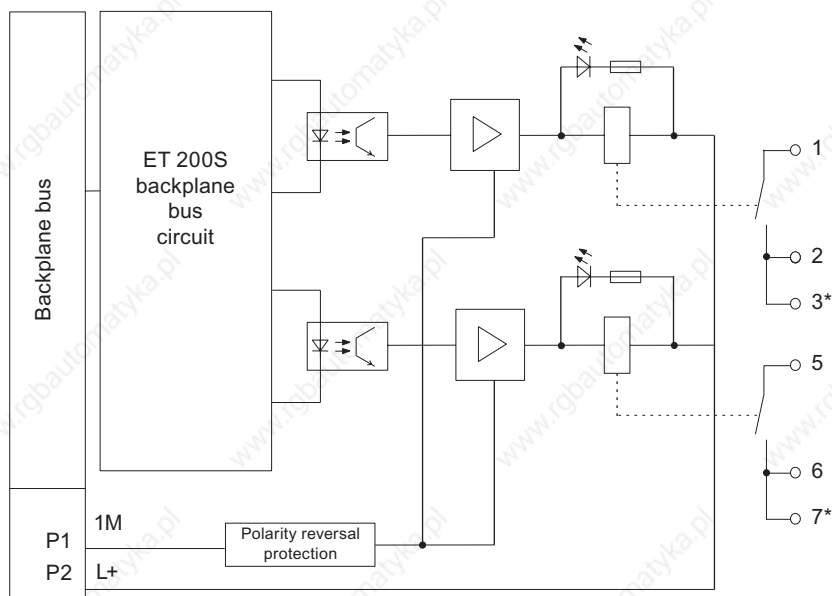
3.19 2RO NO 24 VDC to 120 VDC/5 A, 24 VDC to 230 VAC/5 A digital electronic module (6ES7132-4HB01-0AB0)

| Terminal assignment for 2RO NO 24 VDC to 120 VDC/5 A, 24 VAC to 230 VAC/5 A (6ES7132-4HB01-0AB0) | | | | |
|--|------------|----------|------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | 13 | 5 | 23 | <ul style="list-style-type: none"> 13, 14: Normally open contact, channel 0 23, 24: Normally open contact, channel 1 n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | 14 | 6 | 24 | |
| 3 | 14 | 7 | 24 | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2RO NO 24 VDC to 120 VDC/5 A, 24 VAC to 230 VAC/5 A (6ES7132-4HB01-0AB0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

Block diagram



* From product level 2 of the 2RO NO 24--120 VDC/5 24--230 VAC/5 A the internal bridge between terminals 2 and 6 is not installed. If you require this bridge, it can be replaced by an external bridge between terminals 3 and 7.

Figure 3-21 Block diagram of the 2RO NO 24-120 VDC/5 A, 230 VAC/5 A

Technical Specifications 2RO NO 24 VDC to 120 VDC/5 A, 230 VAC/5 A (6ES7132-4HB01-0AB0)

| Dimensions and Weight | |
|--|--------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 50 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |

3.19 2RO NO 24 VDC to 120 VDC/5 A, 24 VDC to 230 VAC/5 A digital electronic module (6ES7132-4HB01-0AB0)

| Voltages, currents, potentials | |
|--|-----------------------|
| Rated supply voltage L+ (from the power module) | 24 VDC |
| Reverse polarity protection Current per channel | Yes |
| • up to 50 °C | max. 5 A |
| • Up to 60 °C | max. 4 A |
| Galvanic isolation | |
| • Between the channels | Yes |
| • Between the channels and backplane bus | Yes |
| • Between the channels and supply voltage | Yes |
| • Between the supply voltage and backplane bus | Yes |
| Permissible potential difference | |
| • Between the supply voltage and backplane bus | 75 VDC / 60 VAC |
| • Between channels and backplane bus | 240 VAC |
| • Between the channels and supply voltage | 240 VAC |
| Insulation tested | Yes |
| • Between the supply voltage and backplane bus | 500 VDC |
| • Between channels and backplane bus | 1500 VAC |
| • Between the channels and supply voltage | 1500 VAC |
| Current consumption | |
| • From the power supply L+ | max. 30 mA |
| Power dissipation of the module | Typically 0.6 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output current | |
| • Continuous thermal current | max. 5 A |
| • Min. load current | 8 mA |
| • min. voltage | 17 V |
| Connecting two outputs in parallel | |
| • For redundant triggering of a load | no |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 2 Hz |
| • On inductive load | 0.5 Hz |
| • For lamp load | 2 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | no |
| Short-circuit protection of the output ¹ | no |
| ¹ The relay outputs must be fused externally with 6 A. | |

Switching capacity and lifetime of the contacts

With an external protective circuit, the contacts will last longer than specified in the table. This table shows the switching capacity and endurance of the relay contacts:

Table 3-5 Switching capacity and lifetime of the relay contacts

| Resistive load | Voltage | Current | Operating cycles (typical) |
|--------------------|---------|---------|----------------------------|
| For resistive load | 24 VDC | 5.0 A | 0.1 million |
| | | 4.0 A | 0.2 million |
| | | 2.0 A | 0.5 million |
| | | 1.0 A | 1.6 million |
| | | 0.5 A | 4 million |
| | | 0.1A | 7 million |
| | 60 VDC | 0.5 A | 1.6 million |
| | 120 VDC | 0.2 A | 1.6 million |
| | 48 VAC | 2.0 A | 1.6 million |
| | 60 VAC | 2.0 A | 1.2 million |
| | 120 VAC | 5.0 A | 0.1 million |
| | | 3.0 A | 0.2 million |
| | | 2.0 A | 0.4 million |
| | | 1.0 A | 0.8 million |
| | | 0.5 A | 1.5 million |
| | 230 VAC | 5.0 A | 0.1 million |
| | | 3.0 A | 0.2 million |
| | | 2.0 A | 0.4 million |
| | | 1.0 A | 0.8 million |
| | | 0.5 A | 1.5 million |

3.20 2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A digital electronic module (6ES7132-4HB10-0AB0)

| Resistive load | Voltage | Current | Operating cycles (typical) |
|--|---------|-----------|----------------------------|
| For inductive load in accordance with IEC 947-5-1 DC 13/ AC 15 | 24 VDC | 2.0 A | 0.1 million |
| | | 1.0 A | 0.2 million |
| | | 0.5 A | 0.5 million |
| | 60 VDC | 0.5 A | 0.2 million |
| | 120 VDC | 0.2 A | 0.5 million |
| | 48 VAC | 1.0 A | 0.7 million |
| | 60 VAC | 1.0 A | 0.5 million |
| | 120 VAC | 2.0 A | 0.1 million |
| | | 1.0 A | 0.3 million |
| | | 0.5 A | 1 million |
| 0.1A | | 2 million | |
| For inductive load in accordance with IEC 947-5-1 DC 13/ AC 15 | 230 VAC | 2.0 A | 0.1 million |
| | | 1.0 A | 0.3 million |
| | | 0.5 A | 1 million |

3.20 2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A digital electronic module (6ES7132-4HB10-0AB0)

Properties

- Digital electronic module with two relay outputs
- Output current 5 A per output
- Replacement value
- Suitable for solenoid valves, DC contactors, and indicator lights
- Isolated from the supply voltage
- NO and NC contact

Note

If you connect an extra-low voltage system (SELV/PELF) on one channel of the relay subassembly, you can only use an extra-low voltage system (SELV/PELF) on the other channel.

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A (6ES7132-4HB10-0AB0) | | | | |
|--|--------------------------------------|----------|--------------------------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | Common ₀ | 5 | Common ₁ | <ul style="list-style-type: none"> • Common_n, NOC_n or NCC_n, channel n • N: Neutral conductor • n.c.: Not connected (max. DC 30 V can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | Normally open contact ₀ | 6 | Normally open contact ₁ | |
| 3 | Normally closed contact ₀ | 7 | Normally closed contact ₁ | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

3.20 2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A digital electronic module (6ES7132-4HB10-0AB0)

Usable terminal modules

| Usable terminal modules for 2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A (6ES7132-4HB10-0AB0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

Block diagram

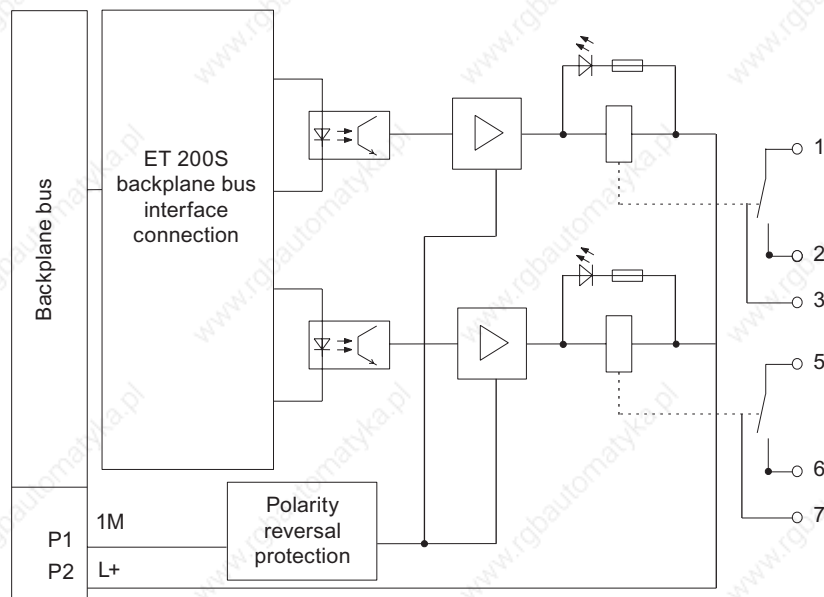


Figure 3-22 Block diagram of the 2RO NO/NC 24 VDC to 48 VDC/5 A 24 VAC to 230 VAC/5 A

2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A Technical Specifications (6ES7132-4HB10-0AB0)

| Dimensions and Weight | |
|---|-------------------|
| Dimensions W × H × D (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 (mm) |
| Weight | Approx. 50 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Unshielded | max. 600 m |
| • Shielded | max. 1000 m |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage L+ (from the power module) | 24 VDC |
| Reverse polarity protection Current per channel | Yes |
| • up to 50 °C | max. 5 A |
| • Up to 60 °C | max. 4 A |
| Galvanic isolation | |
| • Between the channels | Yes |
| • Between channels and backplane bus | Yes |
| • Between the channels and supply voltage | Yes |
| • Between the supply voltage and backplane bus | Yes |
| Permissible potential difference | |
| • Between the supply voltage and backplane bus | 75 VDC / 60 VAC |
| • Between channels and backplane bus | 240 VAC |
| • Between the channels and supply voltage | 240 VAC |
| Insulation tested | |
| • Between the supply voltage and backplane bus | 500 VDC |
| • Between channels and backplane bus | 2500 VDC |
| • Between the channels and supply voltage | 2500 VDC |
| Current consumption | |
| • From the power supply L+ | max. 30 mA |
| • From the backplane bus | max. 10 mA |
| Power dissipation of the module | Typically 0.6 W |

3.20 2RO NO/NC 24 VDC to 48 VDC/5 A, 24 VAC to 230 VAC/5 A digital electronic module (6ES7132-4HB10-0AB0)

| Status, interrupts, diagnostics | |
|--|-----------------------|
| Status display | Green LED per channel |
| Diagnostics function | no |
| Data for selecting an actuator | |
| Output current | |
| • Continuous thermal current | max. 5 A |
| • Min. load current | 8 mA |
| Connecting two outputs in parallel | |
| • for redundant triggering of a load | no |
| • To increase performance | no |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 2 Hz |
| • On inductive load | 0.5 Hz |
| • For lamp load | 2 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | no |
| Short-circuit protection of the output ¹ | no |
| ¹ The relay outputs must be fused externally with 6 A. For installation in a hazardous area as specified by the National Electric Code (NEC) the fuse must only be removed with a suitable tool if the subassembly is not in an explosive area. | |

Switching capacity and lifetime of the contacts

With an external protective circuit, the contacts will last longer than specified in the table.

The normally open and normally closed contacts of the relay have a different lifetime. The table shows the switching capacity and lifetime of the contacts.

Table 3-6 Switching capacity and lifetime of the contacts

| Resistive load | Voltage | Current | Duty cycles (typ.) Normally closed contact | Duty cycles (typ.) Normally open contact |
|--|---------|-------------|--|--|
| For resistive load | 24 VDC | 5.0 A | 0.1 million | 0.15 million |
| | | 4.0 A | 0.2 million | 0.175 million |
| | | 2.0 A | 0.45 million | 0.3 million |
| | | 0.5 A | 1.4 million | 1.1 million |
| | | 0.1A | 1.5 million | 1.5 million |
| | 48 VDC | 2.0 A | 0.15 million | 0.11 million |
| | | 1.0 A | 0.3 million | 0.2 million |
| | | 0.5 A | 0.6 million | 0.6 million |
| | | 0.1A | 0.8 million | 0.6 million |
| | 48 VAC | 2.0 A | 0.45 million | 0.35 million |
| | 60 VAC | 2.0 A | 0.45 million | 0.35 million |
| | 120 VAC | 5.0 A | 0.1 million | 0.1 million |
| | | 3.0 A | 0.2 million | 0.2 million |
| | | 2.0 A | 0.4 million | 0.3 million |
| | | 1.0 A | 0.8 million | 0.6 million |
| | | 0.5 A | 1.5 million | 1.0 million |
| | 230 VAC | 5.0 A | 0.1 million | 0.1 million |
| | | 3.0 A | 0.2 million | 0.2 million |
| | | 2.0 A | 0.4 million | 0.3 million |
| | | 1.0 A | 0.8 million | 0.6 million |
| 0.5 A | | 1.5 million | 1.0 million | |
| For inductive load in accordance with IEC 947-5-1 DC 13/ AC 15 | 24 VDC | 2.0 A | 0.1 million | 0.1 million |
| | | 1.0 A | 0.2 million | 0.2 million |
| | | 0.5 A | 0.5 million | 0.5 million |
| | 48 VDC | 2.0 A | 0.07 million | 0.05 million |
| | | 1.0 A | 0.15 million | 0.1 million |
| | | 0.5 A | 0.4 million | 0.25 million |
| | 48 VAC | 1.0 A | 0.5 million | 0.3 million |
| | 60 VAC | 1.0 A | 0.5 million | 0.3 million |
| | 120 VAC | 2.0 A | 0.1 million | 0.1 million |
| | | 1.0 A | 0.3 million | 0.1 million |
| | | 0.5 A | 0.9 million | 0.6 million |
| | 230 VAC | 0.1 A | 1.5 million | 1.0 million |
| | | 2.0 A | 0.1 million | 0.1 million |
| | | 1.0 A | 0.5 million | 0.3 million |
| | | 0.5 A | 0.9 million | 0.6 million |
| | | | 0.1 A | 1.0 million |

Analog electronics modules

4.1 Introduction

Range of analog electronic modules

The range of analog electronic modules (EM) includes modules for measurement of voltage and current. HIGH SPEED modules can be used for time-critical measurement of voltage and current. HIGH FEATURE modules have a high resolution and precision.

Modules for connection of thermocouples and resistance thermometers or resistors are also available.

The range also includes modules for connecting loads and actuators to current and voltage outputs.

4.2 Analog value representation

4.2.1 Overview

Electronic modules with analog inputs

With the electronics module with analog inputs, continuously variable signals, such as those occurring in temperature measurement and pressure measurement, can be acquired, evaluated, and converted to digital values for further processing.

Electronic modules with analog outputs

With the electronics modules with analog outputs, digital values set by a controller can be converted to a corresponding analog signal (current) in an analog output module and used to control suitable actuators (setpoint input for speed controllers, temperature controllers and similar).

4.2 Analog value representation

Measured Values in the Event of Wire Break Dependent on Enabled Diagnostics

For the measuring range tables

- 1 V to 5 V, 4 mA to 20 mA
- Temperature sensor Pt xxx Standard and Climatic, Ni xx Standard and Climatic, Cu 10 Standard and Climatic
- Thermocouple type E, N, J, K, L, S, R, B, C, T

the following supplements and rules apply:

Table 4-1 Measured Values in the Event of Wire Break Dependent on Enabled Diagnostics

| Format | Parameter assignment | Measured values | | Description |
|--------|--|-----------------|-------------------|---|
| | | Decimal | Hexadecimal | |
| S7 | • Enable "wire break" diagnosis (at 1 V to 5 V, 4 mA to 20 mA, RTD) ¹ | 32767 | 7FFF _H | • Diagnostics message "wire break" |
| | • Enable "wire break test" diagnostics (with TC) | 32767 | 7FFF _H | • Diagnostics message "wire break" |
| | • "Wire break" diagnostics disabled (at 1 to 5 V, 4 to 20 mA, RTD) ¹ • "Overflow/underflow" diagnostics enabled | -32767 | 8000 _H | • Measured value after leaving the undershoot range • "Value under low limit" diagnostic message |
| | • "Wire break" diagnostics disabled (at 1 to 5 V, 4 to 20 mA, RTD) ¹ • "Overflow/underflow" diagnostics disabled | -32767 | 8000 _H | • Measured value after leaving the undershoot range |
| | • "Wire break test" diagnostics disabled (with TC) | --- | --- | • Open input: Undefined measured value |

¹ Measured value limits for wire-break and undershoot detection:
 1 to 5 V: at 0.296 V
 4 mA to 20 mA: at 1.185 mA

4.2.2 Analog Value Representation for Measuring Ranges with SIMATIC S7

Analog value representation

With the same nominal range, the digitized analog value is the same for input and output values. Analog values are represented in two's complement.

The following table shows the analog value representation of the analog electronics modules.

Table 4-2 Analog Value Representation (SIMATIC S7 Format)

| Resolution | Analog Value | | | | | | | | | | | | | | | |
|--------------------------|--------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Bit number | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Significance of the bits | S | 2 ¹⁴ | 2 ¹³ | 2 ¹² | 2 ¹¹ | 2 ¹⁰ | 2 ⁹ | 2 ⁸ | 2 ⁷ | 2 ⁶ | 2 ⁵ | 2 ⁴ | 2 ³ | 2 ² | 2 ¹ | 2 ⁰ |

Sign

The sign (S) of the analog value is always in bit number 15:

- "0" → +
- "1" → -

Measurement resolution

The following table shows the representation of the binary analog values and the corresponding decimal and hexadecimal representation of the units of the analog values.

The table shows the resolutions 11, 12, 13, and 15 bit + sign. Each analog value is entered left aligned in the ACCU. The bits marked with "x" are set to "0".

Table 4-3 Measured Value Resolution of the Analog Values (SIMATIC S7 Format)

| Resolution in Bits | Units | | Analog Value | |
|--------------------|---------|-----------------|-----------------|---------------|
| | Decimal | Hexadecimal | High byte | Low byte |
| 11+ sign | 16 | 10 _H | S 0 0 0 0 0 0 0 | 0 0 1 x x x x |
| 12+ sign | 8 | 8 _H | S 0 0 0 0 0 0 0 | 0 0 0 1 x x x |
| 13+ sign | 4 | 4 _H | S 0 0 0 0 0 0 0 | 0 0 0 0 1 x x |
| 15 + sign | 1 | 1 _H | S 0 0 0 0 0 0 0 | 0 0 0 0 0 0 1 |

Note

This resolution does not apply to temperature values. The converted temperature values are the result of a conversion in the analog electronics module.

Note

The following applies with temperature measurements: When leaving the linearized nominal range, the existing gradient of the characteristic curve is retained in the overflow and underflow range.

4.2.3 Measuring ranges of the analog input modules in SIMATIC S7 format for voltage, current and resistance-type sensors

Introduction

The following tables contain the digitized analog values for the measuring ranges of the analog input modules.

Since the binary representation of the analog values is always the same, these tables contain only a comparison of the measuring ranges with the units.

Voltage measuring ranges: ± 80 mV, ± 2.5 V, ± 5 V, ± 10 V

Table 4-4 SIMATIC S7 format: measuring ranges ± 80 mV, ± 2.5 V, ± 5 V and ± 10 V

| Measuring range ± 80 mV | Measuring range ± 2.5 V | Measuring range ± 5 V | Measuring range ± 10 V | Units | | Range |
|-----------------------------|-----------------------------|---------------------------|----------------------------|---------|-------------------|------------------|
| | | | | Decimal | Hexadecimal | |
| > 94.071 | > 2.9397 | > 5.8794 | > 11.7589 | 32767 | 7FFF _H | Overflow |
| 94.071 | 2.9397 | 5.8794 | 11.7589 | 32511 | 7EFF _H | Overshoot range |
| : | : | : | : | : | : | |
| 80.003 | 2.5001 | 5.0002 | 10.0004 | 27649 | 6C01 _H | Rated range |
| 80.000 | 2.5 | 5.00 | 10.00 | 27648 | 6C00 _H | |
| 60.000 | 1.86 | 3.75 | 7.50 | 20736 | 5100 _H | |
| : | : | : | : | : | : | |
| -60.000 | -1.86 | -3.75 | -7.50 | -20736 | AF00 _H | |
| -80.000 | -2.50 | -5.00 | -10.00 | -27648 | 9400 _H | Undershoot range |
| -80.003 | -2.5001 | -5.0002 | -10.0004 | -27649 | 93FF _H | |
| : | : | : | : | : | : | |
| -94.074 | -2.9397 | -5.8796 | -11.759 | -32512 | 8100 _H | Underflow |
| < -94.074 | < -2.9397 | < -5.8796 | < -11.759 | -32768 | 8000 _H | |

Measuring ranges for voltage and current: 1 V to 5 V, 0 mA to 20 mA, 4 mA to 20 mA

Table 4-5 SIMATIC S7 format: measuring ranges 1 V to 5 V, 0 mA to 20 mA, 4 mA to 20 mA

| Measuring range 1 mA to 5 mA | Measuring range 0 mA to 20 mA | Measuring range 4 mA to 20 mA | Units | | Range |
|---------------------------------|--------------------------------------|----------------------------------|---------|-------------------|------------------|
| | | | Decimal | Hexadecimal | |
| > 5.704 | > 23.5178 | > 22.8142 | 32767 | 7FFF _H | Overflow |
| 5.704 | 23.5178 | 22.8142 | 32511 | 7EFF _H | Overshoot range |
| : | : | : | : | : | |
| 5.000145 | 20.0007 | 20.0005 | 27649 | 6C01 _H | Rated range |
| 5.000 | 20.0000 | 20.0000 | 27648 | 6C00 _H | |
| 4.000 | 15.0000 | 16.0000 | 20736 | 5100 _H | |
| : | : | : | : | : | |
| 1.000 | 0.0000 | 4.0000 | 0 | 0 _H | |
| 0.999855 | Negative values are not supported | 3.9995 | -1 | FFFF _H | Undershoot range |
| : | | . | : | : | |
| 0.296 | | 1.1852 | -4864 | ED00 _H | |
| < 0.296 | | < 1.1852 | -32768 | 8000 _H | Underflow |

Current measuring range: ± 20 mA

Table 4-6 SIMATIC S7 format: Measuring range ± 20 mA

| Measuring range ± 20 mA | Units | | Range |
|-------------------------|---------|-------------------|------------------|
| | Decimal | Hexadecimal | |
| > 23.5150 | 32767 | 7FFF _H | Overflow |
| 23.5150 | 32511 | 7EFF _H | Overshoot range |
| : | : | : | |
| 20.0007 | 27649 | 6C01 _H | Rated range |
| 20.0000 | 27648 | 6C00 _H | |
| 14.9980 | 20736 | 5100 _H | |
| : | : | : | |
| -14.9980 | -20736 | AF00 _H | Undershoot range |
| -20.0000 | -27648 | 9400 _H | |
| -20.0007 | -27649 | 93FF _H | |
| : | : | : | |
| -23.5160 | -32512 | 8100 _H | |
| < -23.5160 | -32768 | 8000 _H | Underflow |

4.2 Analog value representation

Measuring ranges for resistive sensors: 150 Ω, 300 Ω, 600 Ω, 3000 Ω

Table 4-7 SIMATIC S7 format: Measuring ranges 150 Ω, 300 Ω, 600 Ω, 3000 Ω

| Measuring range 150 Ω | Measuring range 300 Ω | Measuring range 600 Ω | Measuring range 3000 Ω | Units | | Range |
|---|--------------------------|--------------------------|---------------------------|---------|-------------------|-------------------------------|
| | | | | Decimal | Hexadecimal | |
| > 176.38 | > 352.77 | > 705.53 | > 3527.67 | 32767 | 7FFF _H | Overflow |
| 176.38 | 352.77 | 705.53 | 3527.67 | 32511 | 7EFF _H | Overshoot range |
| : | : | : | : | : | : | |
| 150.005 | 300.01 | 600.02 | 3000.11 | 27649 | 6C01 _H | |
| 150.00 | 300.00 | 600.00 | 3000.00 | 27648 | 6C00 _H | Rated range |
| 112.50 | 225.00 | 450.00 | 2250.00 | 20736 | 5100 _H | |
| : | : | : | : | : | : | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 _H | |
| (negative values are not physically possible) | | | | -1 | FFFF _H | Undershoot range ¹ |
| | | | | : | : | |
| | | | | -4864 | ED00 _H | Underflow ¹ |
| | | | | -32768 | 8000 _H | |

¹ With faulty connection of resistors

4.2.4 Measuring Range of the Analog Input Modules in SIMATIC S7 Format for Resistance Thermometers

Measuring ranges for resistance thermometer Pt x00 Standard

Table 4-8 SIMATIC S7 format: Measuring ranges Pt 100, 200, 500, 1000 Standard in °C and °F

| Pt x00 Standard in °C (1 digit = 0.1 °C) | Units | | Pt x00 Standard in °F (1 digit = 0.1 °F) | Units | | Range |
|---|---------|-------------------|---|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 1000.0 | 32767 | 7FFF _H | > 1832.0 | 32767 | 7FFF _H | Overflow |
| 1000.0 | 10000 | 2710 _H | 1832.0 | 18320 | 4790 _H | Overshoot range |
| : | : | : | : | : | : | |
| 850.1 | 8501 | 2135 _H | 1562.1 | 15621 | 3D05 _H | |
| 850.0 | 8500 | 2134 _H | 1562.0 | 15620 | 3D04 _H | Rated range |
| : | : | : | : | : | : | |
| -200.0 | -2000 | F830 _H | -328.0 | -3280 | F330 _H | |
| -200.1 | -2001 | F82F _H | -328.1 | -3281 | F32F _H | |
| : | : | : | : | : | : | Undershoot range |
| -243.0 | -2430 | F682 _H | -405.4 | -4054 | F02A _H | |
| < -243.0 | -32768 | 8000 _H | < -405.4 | -32768 | 8000 _H | Underflow |

Measuring ranges for resistance thermometer Pt x00 Climatic

Table 4-9 SIMATIC S7 format: Measuring ranges Pt 100, 200, 500, 1000 Climatic in °C and °F

| Pt x00 Climatic in °C (1 digit = 0.01 °C) | Units | | Pt x00 Climatic in °F (1 digit = 0.01 °F) | Units | | Range |
|--|---------|-------------------|--|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 155.00 | 32767 | 7FFF _H | > 311.00 | 32767 | 7FFF _H | Overflow |
| 155.00 | 15500 | 3C8C _H | 311.00 | 31100 | 797C _H | Overshoot range |
| : | : | : | : | : | : | |
| 130.01 | 13001 | 32C9 _H | 266.01 | 26601 | E9 _H | Rated range |
| 130.00 | 13000 | 32C8 _H | 266.00 | 26600 | E8 _H | |
| : | : | : | : | : | : | Undershoot range |
| -120.00 | -12000 | D120 _H | -184.00 | -18400 | B820 _H | |
| -120.01 | -12001 | D11F _H | -184.01 | -18401 | B81F _H | Underflow |
| : | : | : | : | : | : | |
| -145.00 | -14500 | C75C _H | -229.00 | -22900 | A68C _H | |
| < -145.00 | -32768 | 8000 _H | < -229.00 | -32768 | 8000 _H | |

Measuring ranges for resistance thermometer Ni x00 Standard

Table 4-10 SIMATIC S7 format: Measuring ranges Ni 100, 120, 200, 500, 1000 Standard in °C and °F

| Ni x00 Standard in °C (1 digit = 0.1 °C) | Units | | Ni x00 Standard in °F (1 digit = 0.1 °F) | Units | | Range |
|---|---------|-------------------|---|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 295.0 | 32767 | 7FFF _H | > 563.0 | 32767 | 7FFF _H | Overflow |
| 295.0 | 2950 | B86 _H | 563.0 | 5630 | 15FE _H | Overshoot range |
| : | : | : | : | : | : | |
| 250.1 | 2501 | 9C5 _H | 482.1 | 4821 | 12D5 _H | Rated range |
| 250.0 | 2500 | 9C4 _H | 482.0 | 4820 | 12D4 _H | |
| : | : | : | : | : | : | Undershoot range |
| -60.0 | -600 | FDA8 _H | -76.0 | -760 | FD08 _H | |
| -60.1 | -601 | FDA7 _H | -76.1 | -761 | FD07 _H | Underflow |
| : | : | : | : | : | : | |
| -105.0 | -1050 | FBE6 _H | -157.0 | -1570 | F9DE _H | |
| < -105.0 | -32768 | 8000 _H | < -157.0 | -32768 | 8000 _H | |

Measuring ranges for resistance thermometer Ni x00 Climatic

Table 4-11 SIMATIC S7 format: Measuring ranges Ni 100, 120, 200, 500, 1000 Climatic in °C and °F

| Ni x00 Climatic in °C (1 digit = 0.01 °C) | Units | | Ni x00 Climatic in °F (1 digit = 0.01 °F) | Units | | Range |
|--|---------|-------------------|--|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 295.00 | 32767 | 7FFF _H | > 325.11 | 32767 | 7FFF _H | Overflow |
| 295.00 | 29500 | 733C _H | 327.66 | 32766 | 7FFE _H | Overshoot range |
| : | : | : | : | : | : | |
| 250.01 | 25001 | 61A9 _H | 280.01 | 28001 | 6D61 _H | Rated range |
| 250.00 | 25000 | 61A8 _H | 280.00 | 28000 | 6D60 _H | |
| : | : | : | : | : | : | Undershoot range |
| -60.00 | -6000 | E890 _H | -76.00 | -7600 | E250 _H | |
| -60.01 | -6001 | E88F _H | -76.01 | -7601 | E24F _H | Underflow |
| : | : | : | : | : | : | |
| -105.00 | -10500 | D6FC _H | -157.00 | -15700 | C2AC _H | |
| < -105.00 | -32768 | 8000 _H | < -157.00 | -32768 | 8000 _H | |

Measuring ranges for resistance thermometer Cu 10 Standard

Table 4-12 SIMATIC S7 format: Measuring ranges Cu 10 Standard in °C and °F

| Cu 10 Standard in °C (1 digit = 0.1 °C) | Units | | Cu 10 Standard in °F (1 digit = 0.1 °F) | Units | | Range |
|--|---------|-------------------|--|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 312.0 | 32767 | 7FFF _H | > 593.6 | 32767 | 7FFF _H | Overflow |
| 312.0 | 3120 | C30 _H | 593.6 | 5936 | 1730 _H | Overshoot range |
| : | : | : | : | : | : | |
| 260.1 | 2601 | A29 _H | 500.1 | 5001 | 12D5 _H | Rated range |
| 260.0 | 2600 | A28 _H | 500.0 | 5000 | 1389 _H | |
| : | : | : | : | : | : | Undershoot range |
| -200.0 | -2000 | F830 _H | -328.0 | -3280 | F330 _H | |
| -200.1 | -2001 | F82F _H | -328.1 | -3281 | F32F _H | Underflow |
| : | : | : | : | : | : | |
| -240.0 | -2400 | F6A0 _H | -400.0 | -4000 | F060 _H | |
| < -240.0 | -32768 | 8000 _H | < -400.0 | -32768 | 8000 _H | |

Measuring ranges for resistance thermometer Cu 10 Climatic

Table 4-13 SIMATIC S7 format: Measuring ranges Cu 10 Climatic in °C and °F

| Cu 10 Climatic in °C (1 digit = 0.01 °C) | Units | | Cu 10 Climatic in °F (1 digit = 0.01° F) | Units | | Range |
|---|---------|-------------------|---|---------|--------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 180.00 | 32767 | 7FFF _H | > 325.11 | 32767 | 7FFF _H | Overflow |
| 180.00 | 18000 | H | 327.66 | 32766 | 7FFE _H | Overshoot range |
| : | : | : | : | : | : | |
| 150.01 | 15001 | 3A99 _H | 280.01 | 28001 | 6D61A _H | Rated range |
| 150.00 | 15000 | 3A98 _H | 280.00 | 28000 | 6D60 _H | |
| : | : | : | : | : | : | Undershoot range |
| -50.00 | -5000 | EC78 _H | -58.00 | -5800 | E958 _H | |
| -50.01 | -5001 | EC77 _H | -58.01 | -5801 | E957 _H | Undershoot range |
| : | : | : | : | : | : | |
| -60.00 | -6000 | E890 _H | -76.00 | -7600 | E250 _H | Underflow |
| < -60.00 | -32768 | 8000 _H | < -76.00 | -32768 | 8000 _H | |

4.2.5 Measuring Range of the Analog Input Modules in SIMATIC S7 Format for Thermocouples

Measuring range for thermocouple: Type B

Table 4-14 SIMATIC S7 format: Measuring range Type B in °C and °F

| Type B in °C | Units | | Type B in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 2070.0 | 32767 | 7FFF _H | > 3276.6 | 32767 | 7FFF _H | Overflow |
| 2070.0 | 20700 | 50DC _H | 3276.6 | 32766 | 7FFE _H | Overshoot range |
| : | : | : | : | : | : | |
| 1820.1 | 18201 | 4719 _H | 2786.6 | 27866 | 6CDA _H | Rated range |
| 1820.0 | 18200 | 4718 _H | 2786.5 | 27865 | 6CD9 _H | |
| : | : | : | : | : | : | Undershoot range |
| 0.0 | 0 | 0000 _H | 32 | 320 | 0140 _H | |
| -0.1 | -1 | FFFF _H | 31.9 | 319 | 013F _H | Undershoot range |
| : | : | : | : | : | : | |
| -120.0 | -1200 | FB50 _H | -184.0 | -1840 | F8D0 _H | Underflow |
| < -120.0 | -32768 | 8000 _H | < -184.0 | -32768 | 8000 _H | |

Measuring range for thermocouple: Type C

Table 4-15 SIMATIC S7 format: Measuring range Type C in °C and °F

| Type C in °C | Units | | Type C in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 2500.0 | 32767 | 7FFF _H | > 3276.6 | 32767 | 7FFF _H | Overflow |
| 2500.0 | 25000 | 61A8 _H | 3276.6 | 32766 | 7FFE _H | Overshoot range |
| : | : | : | : | : | : | |
| 2315.1 | 23151 | 5A6F _H | 2786.6 | 27866 | 6CDA _H | Rated range |
| 2315.0 | 23150 | 5A6E _H | 2786.5 | 27865 | 6CD9 _H | |
| : | : | : | : | : | : | Undershoot range |
| 0.0 | 0 | 0000 _H | 32.0 | 320 | 0140 _H | |
| 0.1 | -1 | FFFF _H | 31.9 | 319 | 013F _H | Undershoot range |
| : | : | : | : | : | : | |
| -120.0 | -1200 | FB50 _H | -184.0 | -1840 | F8D0 _H | Underflow |
| < -120.0 | -32768 | 8000 _H | < -184.0 | -32768 | 8000 _H | |

Measuring range for thermocouple type E

Table 4-16 SIMATIC S7 format: Measuring range Type E in °C and °F

| Type E in °C | Units | | Type E in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|-----------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 1200.0 | 32767 | 7FFF _H | > 2192.0 | 32767 | 7FFF _H | Overflow |
| 1200.0 | 12000 | 2EE0 _H | 2192.0 | 21920 | 55A0 _H | Overshoot range |
| : | : | : | : | : | : | |
| 1000.1 | 10001 | 2711 _H | 1832.1 | 18321 | 4791 _H | Rated range |
| 1000.0 | 10000 | 2710 _H | 1832.0 | 18320 | 4790 _H | |
| : | : | : | : | : | : | Underflow |
| -270.0 | -2700 | F574 _H | -454.0 | -4540 | EE44 _H | |
| < -270.0 | - 32768 | 8000 _H | < -454.0 | - 32768 | 8000 _H | |

Measuring range for thermocouple type J

Table 4-17 SIMATIC S7 format: Measuring range Type J in °C and °F

| Type J in °C | Units | | Type J in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|-----------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 1450.0 | 32767 | 7FFF _H | > 2642.0 | 32767 | 7FFF _H | Overflow |
| 1450.0 | 14500 | 38A4 _H | 2642.0 | 26420 | 6734 _H | Overshoot range |
| : | : | : | : | : | : | |
| 1200.1 | 12010 | 2EEA _H | 2192.1 | 21921 | 55A1 _H | Rated range |
| 1200.0 | 12000 | 2EE0 _H | 2192.0 | 21920 | 55A0 _H | |
| : | : | : | : | : | : | Underflow |
| -210.0 | -2100 | F7CC _H | -346.0 | -3460 | F27C _H | |
| < -210.0 | - 32768 | 8000 _H | < -346.0 | - 32768 | 8000 _H | |

Measuring range for thermocouple type K

Table 4-18 SIMATIC S7 format: Measuring range Type K in °C and °F

| Type K in °C | Units | | Type K in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|-----------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 1622.0 | 32767 | 7FFF _H | > 2951.6 | 32767 | 7FFF _H | Overflow |
| 1622.0 | 16220 | 3F5C _H | 2951.6 | 29516 | 734C _H | Overshoot range |
| : | : | : | : | : | : | |
| 1372.1 | 13721 | 3599 _H | 2501.7 | 25062 | 61B9 _H | Rated range |
| 1372.0 | 13720 | 3589 _H | 2501.6 | 25061 | 61B8 _H | |
| : | : | : | : | : | : | Underflow |
| -270.0 | -2700 | F574 _H | -454.0 | -4540 | EE44 _H | |
| < -270.0 | - 32768 | 8000 _H | < -454.0 | - 32768 | 8000 _H | |

4.2 Analog value representation

Measuring range for thermocouple type L

Table 4-19 SIMATIC S7 format: Measuring range Type L in °C and °F

| Type L in °C | Units | | Type L in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|-----------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 1150.0 | 32767 | 7FFF _H | > 2102.0 | 32767 | 7FFF _H | Overflow |
| 1150.0 | 11500 | 2CEC _H | 2102.0 | 21020 | 521C _H | Overshoot range |
| : | : | : | : | : | : | |
| 900.1 | 9001 | 2329 _H | 1652.1 | 16521 | 4089 _H | Rated range |
| 900.0 | 9000 | 2328 _H | 1652.0 | 16520 | 4088 _H | |
| : | : | : | : | : | : | Underflow |
| -200.0 | -2000 | F830 _H | -328.0 | -3280 | F330 _H | |
| < -200.0 | -32768 | 8000 _H | < -328.0 | -32768 | 8000 _H | |

Measuring range for thermocouple type N

Table 4-20 SIMATIC S7 format: Measuring range Type N in °C and °F

| Type N in °C | Units | | Type N in °F | Units | | Range |
|--------------|---------|-------------------|--------------|-------------------|--------------------|-----------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 1550.0 | 32767 | 7FFF _H | > 2822.0 | 32767 | 7FFF _H | Overflow |
| 1550.0 | 15500 | 3C8C _H | 2822.0 | 28220 | 6E3C _H | Overshoot range |
| : | : | : | : | : | : | |
| 1300.1 | 13001 | 32C9 _H | 2372.1 | 23721 | 5CA9 _H | Rated range |
| 1300.0 | 13000 | 32C8 _H | 2372.0 | 23720 | 5CA8 _H | |
| : | : | : | : | : | : | Underflow |
| -270.0 | -2700 | F574 _H | -454.0 | -4540 | EE44 _H | |
| < -270.0 | -32768 | 8000 _H | -32768 | 8000 _H | <EE44 _H | |

Measuring range for thermocouple types R, S

Table 4-21 SIMATIC S7 format: Measuring range Type R, S in °C and °F

| Type R, S in °C | Units | | Type R, S in °F | Units | | Range |
|-----------------|---------|-------------------|-----------------|---------|-------------------|------------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 2019.0 | 32767 | 7FFF _H | > 3276.6 | 32767 | 7FFF _H | Overflow |
| 2019.0 | 20190 | 4EDE _H | 3276.6 | 32766 | 7FFE _H | Overshoot range |
| : | : | : | : | : | : | |
| 1769.1 | 17691 | 451B _H | 3216.3 | 32163 | 7DA3 _H | Rated range |
| 1769.0 | 17690 | 451A _H | 3216.2 | 32162 | 7DA2 _H | |
| : | : | : | : | : | : | Undershoot range |
| -50.0 | -500 | FE0C _H | -58.0 | -580 | FDBC _H | |
| -50.1 | -510 | FE0B _H | -58.1 | -581 | FDBB _H | Underflow |
| : | : | : | : | : | : | |
| -170.0 | -1700 | F95C _H | -274.0 | -2740 | F54C _H | |
| < -170.0 | -32768 | 8000 _H | < -274.0 | -32768 | 8000 _H | |

Measuring range for thermocouple type T

Table 4-22 SIMATIC S7 format: Measuring range Type T in °C and °F

| Type T in °C | Units | | Type T in °F | Units | | Range |
|--------------|---------|-------------------|--------------|---------|-------------------|-----------------|
| | Decimal | Hexadecimal | | Decimal | Hexadecimal | |
| > 540.0 | 32767 | 7FFF _H | > 1004.0 | 32767 | 7FFF _H | Overflow |
| 540.0 | 5400 | 1518 _H | 1004.0 | 10040 | 2738 _H | Overshoot range |
| : | : | : | : | : | : | |
| 400.1 | 4001 | 0FA1 _H | 752.1 | 7521 | 1DC1 _H | Rated range |
| 400.0 | 4000 | 0FA0 _H | 752.0 | 7520 | 1D60 _H | |
| : | : | : | : | : | : | Underflow |
| -270.0 | -2700 | F574 _H | -454.0 | -4540 | EE44 _H | |
| < -270.0 | -32768 | 8000 _H | < -454.0 | -32768 | 8000 _H | |

4.2 Analog value representation

4.2.6 Output ranges of the analog output modules in SIMATIC S7 format for voltage and current

Output modules for voltage and current: $\pm 5\text{ V}$; $\pm 10\text{ V}$; $\pm 20\text{ mA}$

Table 4-23 SIMATIC S7 format: output range $\pm 5\text{ V}$; $\pm 10\text{ V}$; $\pm 20\text{ mA}$

| Output range $\pm 5\text{ V}$ | Output range $\pm 10\text{ V}$ | Output range $\pm 20\text{ V}$ | Units | | Range |
|----------------------------------|-----------------------------------|-----------------------------------|----------|---------------------|------------------|
| | | | Decimal | Hexadecima l | |
| 0 | 0 | 0 | > 32511 | > 7EFF _H | Overflow |
| 5.8800 | 11.7589 | 23.5150 | 32511 | 7EFF _H | Overshoot range |
| : | : | : | : | : | |
| 5.0002 | 10.0004 | 20.0007 | 27649 | 6C01 _H | Rated range |
| 5.0000 | 10.0000 | 20.0000 | 27648 | 6C00 _H | |
| 3.7500 | 7.5000 | 14.9980 | 20736 | 5100 _H | |
| : | : | : | : | : | |
| -3.7500 | -7.5000 | -14.9980 | -20736 | AF00 _H | |
| -5.0000 | -10.0000 | -20.0000 | -27648 | 9400 _H | Undershoot range |
| -5.0002 | -10.0004 | -20.0007 | -27649 | 93FF _H | |
| : | : | : | : | : | |
| -5.8800 | -11.7589 | -23.5160 | -32512 | 8100 _H | Underflow |
| 0 | 0 | < -23.5160 | < -32512 | < 8100 _H | |

Output modules for voltage and current: 1 V to 5 V; 4 mA to 20 mA

Table 4-24 SIMATIC S7 format: Output ranges 1 V to 5 V; 4 mA to 20 mA

| Output range Up to 5 V | Output range up to 20 mA | Units | | Range |
|---------------------------|-----------------------------|---------|---------------------|------------------|
| | | Decimal | Hexadeci mal | |
| 0 | 0 | > 32511 | > 7EFF _H | Overflow |
| 5.7000 | 22.8100 | 32511 | 7EFF _H | Overshoot range |
| : | : | : | : | |
| 5.0002 | 20.0005 | 27649 | 6C01 _H | Rated range |
| 5.0000 | 20.0000 | 27648 | 6C00 _H | |
| : | : | : | : | |
| 1.0000 | 4.0000 | 0 | 0 _H | |
| 0.9998 | 3.9995 | -1 | FFFF _H | |
| : | : | : | : | Undershoot range |
| 0 | 0 | -6912 | E500 _H | |
| 0 | 0 | < -6913 | < E4FF _H | Underflow |

4.3 Basics of analog value processing

4.3.1 Connecting measuring sensors

Introduction

You can connect different measuring sensors to the analog input modules, depending on the type of module involved:

- Voltage sensor
- Current sensors as:
 - 2-wire transducer
 - 4-wire transducer
- Resistance-type sensor

In this chapter you will find out how to connect the measuring sensors and what to watch for when doing so.

Lines for analog signals

You should use shielded and twisted-pair lines for the analog signals. This reduces the effect of interference. You should ground the shield of the analog lines at both ends of the line. If there are differences in potential between the ends of the line, a compensating current flows via the shield that can interfere with the analog signals. If this is the case, you should only ground the shield at one end of the line.

Analog Input Modules

In the case of the analog input modules there is galvanic isolation:

- Between the logic circuitry and backplane bus
- Between the load voltage and the channels. The following differences exist:
 - No isolation: Link between M_{ANA} and central grounding point
 - Isolation: No link between M_{ANA} and the central grounding point (U_{ISO})

Analog Output Modules

In the case of the analog output modules there is generally galvanic isolation:

- Between the logic circuitry and backplane bus
- Between the load voltage and M_{ANA} .

Note

Ensure that this potential difference U_{ISO} does not exceed the permitted value. If there is a possibility of exceeding the permitted value, make a connection between terminal M_{ANA} and the central grounding point.

Connecting measuring sensors to analog inputs

Between the measuring lines M- of the input channels and the reference point of the measuring circuit M_{ANA} there can be only a limited potential difference U_{CM} (common-mode voltage). To ensure that the permitted value is not exceeded, you must take different steps depending on the whether the sensors are isolated or non-isolated. The steps you have to take are described in this chapter.

Generally speaking, however, when connecting two-wire measuring transducers for current measurement and when connecting resistance-type sensors, you should not make a connection from M- to M_{ANA} . This also applies to inputs that have been assigned parameters correspondingly but unused.

Note

For the analog input modules 2AI U, 2AI RTD, and 2AI TC, you must short-circuit unused analog inputs.

Abbreviations used

The meanings of the abbreviations in the figures below are as follows:

| | |
|-----------|--|
| M + | Measuring line (positive) |
| M - | Measuring line (negative) |
| M_{ANA} | Reference potential of the analog measuring circuit |
| M | Frame connection |
| L + | Rated load voltage 24 VDC |
| U_{CM} | Potential difference between inputs and reference potential of the measuring circuit M_{ANA} |
| U_{ISO} | Potential difference between M_{ANA} and central grounding point |

Isolated measuring sensors

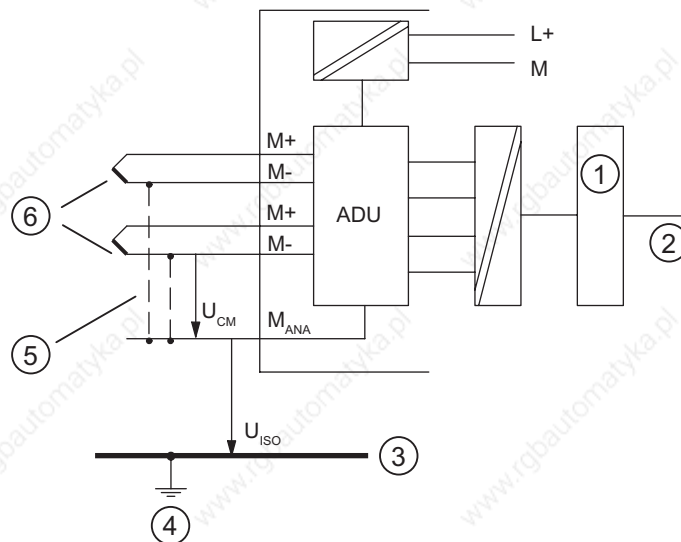
The isolated measuring sensors are not connected to the local ground potential. They can be floating. Depending on local conditions or interference, potential differences U_{CM} (static or dynamic) can occur between the measuring lines M- of the input channels and the reference point of the measuring circuit M_{ANA} .

To ensure that the permitted value for U_{CM} is not exceeded in environments with strong EMC interference, the following applies:

- In the case of the analog input modules 2AI U, 2AI I 4WIRE, and 2AI TC: Connect M- with M_{ANA} !
- When connecting two-wire measuring transducers for current measurement and when connecting resistance-type sensors, you must not connect M- to M_{ANA} .

The following figure illustrates the connection of isolated measuring sensors to the floating analog input modules.

Connection of isolated measuring sensors to a floating analog input module:



- (1) Logic
- (2) Backplane bus
- (3) Ground bus
- (4) Central grounding point
- (5) Recommended connection
- (6) Isolated measuring sensors

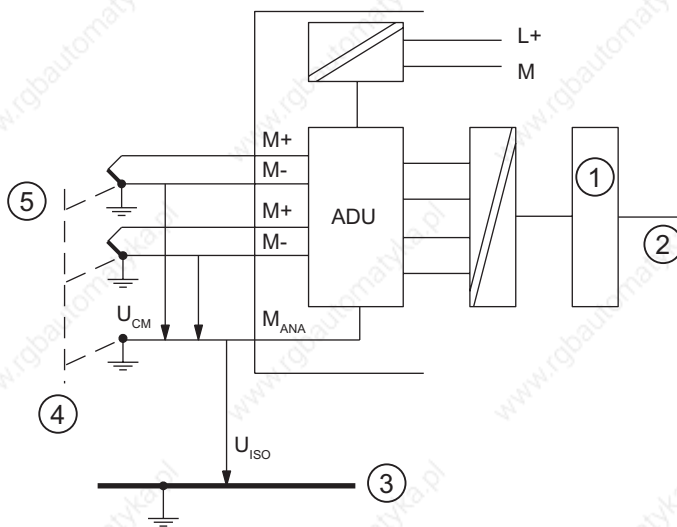
Non-isolated measuring sensors

The non-isolated measuring sensors are connected to the local ground potential. You must connect M_{ANA} to the ground potential. Depending on local conditions or interference, potential differences U_{CM} (static or dynamic) can occur between the locally distributed measuring points.

If the permitted value for U_{CM} is exceeded, there must be equipotential bonding conductors between the measuring points.

The following figure illustrates the connection of non-isolated measuring sensors to a floating analog input module.

Connection of non-isolated measuring sensors to a floating analog input module:



- (1) Logic
- (2) Backplane bus
- (3) Ground bus
- (4) Equipotential bonding cable
- (5) Non-isolated measuring sensors

Operating four-wire measuring transducers on an external voltage supply

If there is isolation between the output and the supply of the measuring transducer, you can connect it to the 2AI | 4WIRE without additional connections.

If there is no isolation between the output and the supply of the measuring transducer, you can connect it to the 2AI | 4WIRE only if the reference potential of the power supply voltages (24 VDC) is the same.

If there is an increase in interference radiation, a connection between M- and M_{ANA} on the terminal module of the 2AI | 4WIRE is recommended.

4.3.2 Connecting Thermocouples

Introduction

This section contains additional information on connecting thermocouples.

Compensation of the reference junction temperature

There are various ways of obtaining the reference junction temperature in order to get an absolute temperature value from the temperature difference between the reference junction and the measuring point.

Table 4-25 Compensation of the reference junction temperature

| Option | Description | Reference junction parameters |
|--|---|---|
| No compensation | You record not only the temperature of the measurement point. The temperature of the reference junction (transition from Cu line to thermocouple line) also affects the thermo-electromotive force. The measured value is thus errored. | None |
| Use of a compensating box on the incoming lines of a single thermocouple | You compensate using a compensating box. The compensating box is the transition point from the Cu line to the thermocouple line. No further processing is necessary through the 2AI TC Standard. | None |
| Use of a Pt 100 Climatic Range resistance thermometer to record the reference junction temperature (best method) | You can record the reference junction temperature using a resistance thermometer (Pt 100 Climatic Range). Given appropriate parameter assignment, this temperature value in the ET 200S is distributed to the 2AI TC Standard modules and calculated in the modules together with the temperature value obtained for the measurement point. Number of reference junctions: 1 | The parameter assignment of the IM151-1 and the 2AI TC must be coordinated: <ul style="list-style-type: none"> • 2AI RTD Standard assigned parameters to the Pt 100 climatic range at the correct slot; • 2AI TC Standard: Reference junction : RTD; select reference junction number 1 • IM : Assignment of the reference junction to a slot with the 2AI RTD Standard; selection of a channel; |
| Internal compensation in the case of the 2AI TC High Feature | There is a temperature sensor in the TM-E15S24-AT and TM-E15C24-AT terminal modules. The temperature sensor reports the temperature of the terminals to the 2AI TC High Feature. This value is then calculated together with the measured value from the channel of the electronic module. | <ul style="list-style-type: none"> • 2AI TC High Feature: Reference junction: Yes |

Extension to a reference junction

The thermocouples can be extended from their connection point by means of equalizing lines to the reference junction (transition to Cu line) or the compensating box. The reference junction can also be an ET 200S terminal module.

The equalization lines are made of the same material as the wires of the thermocouple. The incoming lines are made of copper. Ensure correct polarity when connecting.

Use of a compensating box

The influence of the temperature on the reference junction of a thermocouple (for example, terminal boxes) can be adjusted with a compensating box.

The compensating box contains a bridge circuit that is adjusted for a certain reference junction temperature (compensating temperature). You connect the thermocouples or their adjustment lines to the compensating box. The compensating box then forms the reference junction.

If the actual reference temperature differs from the compensating temperature, the temperature-dependent bridge resistance changes. A positive or negative compensation voltage occurs that is added to the thermo-electromotive force.

Compensating boxes with a **reference junction temperature of 0 °C** must be used for the compensation of the analog input modules.

Pay attention to:

- The compensating box must be supplied on an isolated basis.
- The power supply unit must have adequate interference filtering (by means of a grounded shielding winding, for example).

Compensation by means of a resistance thermometer at the 2AI RTD

If thermocouples that are connected to the inputs of the 2AI TC have the same reference junction, compensate by means of a 2AI RTD.

For both channels of the 2AI TC module, you can select "RTD" or "None" as the reference junction. If you select "RTD," the same reference junction (RTD channel) is always used for both channels.

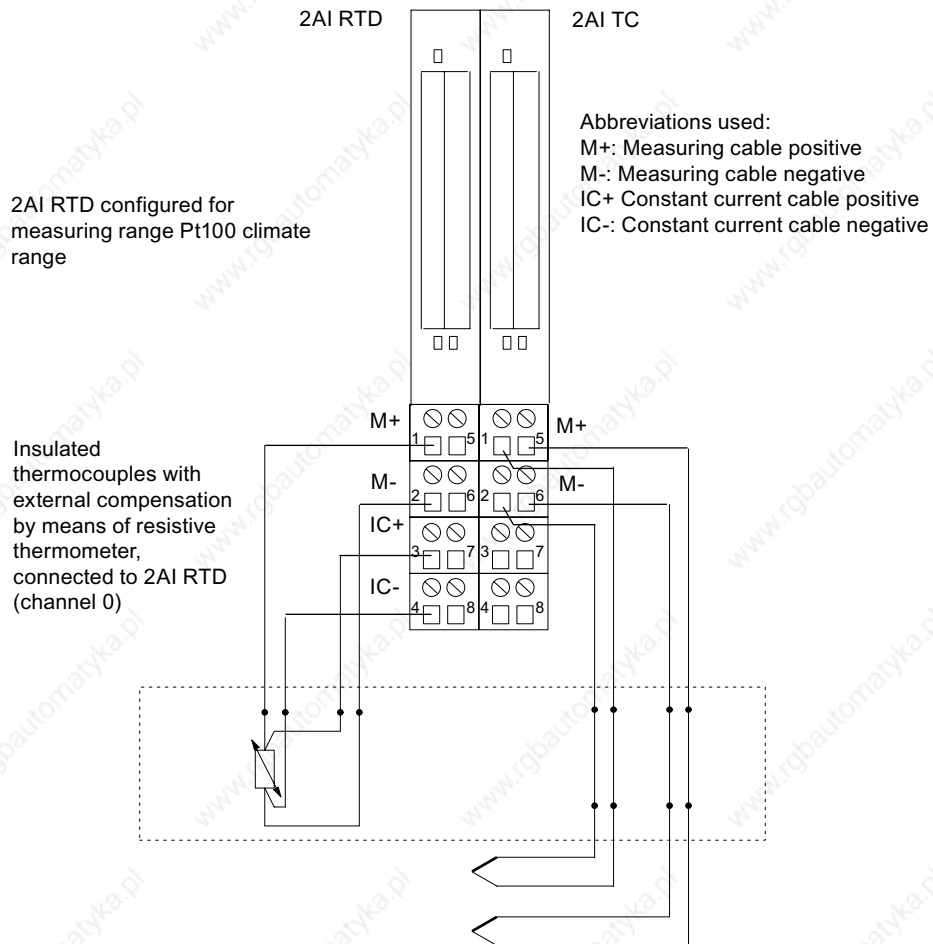


Figure 4-1 Compensation by means of the 2AI RTD

Parameter assignment of the reference junction for the 2AI TC and the interface module

You set the reference junctions for the 2AI TC electronic modules by means of the following parameters:

Table 4-26 Reference junction parameters

| Parameters | Module | Range of values | Description |
|---|--------|---|---|
| Reference junction slot | IM 151 | None, 2 to 12 (IM151-1 BASIC) None, 2 to 13 (IM151-1 COMPACT) none, 2 to 63 (IM151-1 HIGH FEATURE, IM151-1 STANDARD, IM151-1 FO STANDARD) | A slot with the channel for measuring the reference temperature (determining the compensation value) can be assigned with this parameter. |
| Reference junction input | IM 151 | RTD at channel 0 RTD at channel 1 | This parameter allows you to set the channel (0/1) for measuring the reference temperature (calculation of the compensation value) for the assigned slot. |
| Reference junction E0 and reference junction E1 | AI TC | None, RTD | This parameter allows you to enable the use of the reference junction. |
| Reference junction number | AI TC | 1 | With this parameter, you assign the reference junction (1) containing the reference temperature (compensation value). |

Example of assigning parameters of reference junctions

Setup: For simplification, only RTD and TC modules are shown in the following figure:

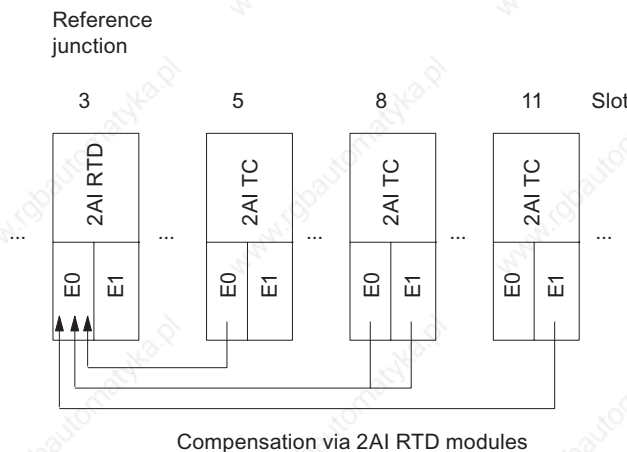


Figure 4-2 Example of assigning parameters of reference junctions

Relevant parameters to be set for the interface module:

| Parameters | Value |
|--------------------------|------------------|
| Reference junction slot | 3 |
| Reference junction input | RTD at channel 0 |

Requires (relevant) parameters for 2AI RTD and 2AI TC:

| Slot | Parameters | Value |
|-------------|------------------------------|-----------------------|
| 3 (2AI RTD) | Type/range of measurement E0 | RTD-4L Pt100 Climatic |
| 5 (2AI TC) | Reference junction E0 | RTD |
| | Reference junction E1 | None |
| | Reference junction number | 1 |
| | Type/range of measurement E0 | TC-EL Type... |
| | Type/range of measurement E1 | (any) |
| 8 (2AI TC) | Reference junction E0 | RTD |
| | Reference junction E1 | RTD |
| | Reference junction number | 1 |
| | Type/range of measurement E0 | TC-EL Type... |
| | Type/range of measurement E1 | TC-EL Type... |
| 11 (2AI TC) | Reference junction E0 | None |
| | Reference junction E1 | RTD |
| | Reference junction number | 1 |
| | Type/range of measurement E0 | (any) |
| | Type/range of measurement E1 | TC-EL Type... |

Non-isolated thermocouples

When you use non-isolated thermocouples, you must comply with the permitted common-mode voltage.

4.3.3 Wiring unused channels of the analog input modules

Rules

Pay attention to the following instructions when wiring unused channels:

- "Disable" unused input channels when setting parameters.
- A disabled channel always returns the value 7FFF_H.
- The module cycle time is halved with the standard modules 2AI U, 2AI I 2WIRE, 2AI I 4WIRE, 2AI RTD Standard, 2AI RTD High Feature and 2AI TC Standard, 2AI TC High Feature.
- The cycle time remains unchanged with the standard module 4AI I 2WIRE.
- The cycle time remains unchanged at 1 ms with the HIGH SPEED modules 2AI U, 2AI I 2WIRE and 2AI I 4WIRE.
- To maintain the allowable potential differences (U_{CM}) bridges must be wired at the terminal module with the unused channels. This is required with the following modules:

| Analog Input Module | TM connection terminal | | | | | | | |
|---|------------------------|---|---|---|-----------|---|---|---|
| | Channel 0 | | | | Channel 1 | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 2AI U Standard | ● — ● — ● | | | | ● — ● — ● | | | |
| 2AI RTD Standard, 2AI RTD High Feature, 2AI TC High Feature | ● — ● | | | | ● — ● | | | |
| 2AI TC Standard | ● — ● — ● | | | | ● — ● — ● | | | |
| 2AI U High Speed | ● — ● — ● | | | | ● — ● — ● | | | |

4.4 Response of the analog modules during operation and if faults occur

4.4.1 Influence of the power supply and the operating status on analog input and output values

The input and output values of the analog modules are dependent on the power supply for electronics/sensors and on the operating state of the PLC (CPU of the DP master). The table below shows this dependency..

Table 4-27 Dependence of the Input and Output Values on the Operating State of the PLC (CPU of the DP Master) and the Power Supply Voltage L+

| Operating State of the PLC (CPU of the DP Master) | | Power supply L+ on ET 200S (power module) | Input Value of the Electronics Module with Analog Inputs (Evaluation Possible on the CPU of the DP Master) | Output Value of the Electronics Module with Analog Outputs |
|---|------|---|--|--|
| POWER ON | RUN | L+ present | Process values 7FFF _H until first conversion after startup, or after assignment of parameters for the module is completed. | PLC values Until first value output: <ul style="list-style-type: none"> • After startup, a signal of 0 mA or 0 V is output. • Dependent on the parameter "CPU/ master STOP" |
| | | L+ missing | 7FFF _H | - |
| POWER ON | STOP | L+ present | Process value | Dependent on the parameter "CPU/ master STOP" |
| | | L+ missing | 7FFF _H | - |
| POWER OFF | - | L+ present | - | Dependent on the parameter "CPU/ master STOP" |
| | | L+ missing | - | - |

4.4 Response of the analog modules during operation and if faults occur

4.4.2 Influence of the Value Range on the Analog Input

The response of the electronics modules with analog inputs depends on the part of the value range in which the input values are located. The table below shows this dependency..

Table 4-28 Response of the Analog Modules, Depending on the Location of the Analog Input Value in the Range of Values

| Measured value within ... | Input value in SIMATIC S7 Format | Input value in SIMATIC S5 Format |
|--|----------------------------------|--|
| Rated range | Measured value | Measured value |
| Overshoot/undershoot range | Measured value | Measured value |
| Overflow | 7FFF _H | End of overshoot range +1 plus overflow bit |
| Underflow | 8000 _H | End of undershoot range -1 plus overflow bit |
| Before setting parameters or with faulty parameters ¹ | 7FFF _H | 7FFF _H |

¹ With 2AI U Standard, 2AI I 2WIRE Standard, 2AI I 4WIRE Standard, 2AI RTD Standard, 2AI TC Standard with product status 1 applies: If the parameter setting error diagnostics message is triggered because of incorrect parameter setting (e.g. wire break in measuring range ± 20 mA), the SF LED on the module lights and the diagnosis can be evaluated. In this status correct input values are sent to the DP master.

4.4.3 Influence of the Value Range on the Analog Output

The response of the electronics modules with analog outputs depends on the part of the value range in which the output values are located. The table below shows this dependency..

Table 4-29 Response of the Analog Modules, Depending on the Location of the Analog Output Value in the Range of Values

| Output Value is in ... | Input value in SIMATIC S5/S7 format |
|--|-------------------------------------|
| Rated range | Value from DP master |
| Overshoot/undershoot range | Value from DP master |
| Overflow | 0-signal |
| Underflow | 0-signal |
| Before setting parameters or with faulty parameters ¹ | 0-signal |

¹ With 2AO U Standard, 2AO I Standard with product status 1 applies: If the configured substitute value is outside the nominal range, a diagnostics message for a parameter setting error is registered and the SF LED lights. In this status the output values transferred from the DP master are output at the analog output modules.

4.4.4 Using the shield connection

Rules

To prevent interference we recommend the following with the analog electronic modules:

- Use shielded wires to the sensors and actuators.
- Lay out the wire shields on the shield connection.
- Connect the shield connection with low impedance to the ground bus.

4.5 Parameters for analog electronic modules

4.5.1 Parameters for analog electronic modules 2AI U Standard, 2AI I 2WIRE Standard, 4AI I 2WIRE Standard, 2AI I 4WIRE Standard

Table 4-30 Parameters for analog input modules U, I Standard

| 2AI U Standard | 2AI I 2WIRE Standard 4AI I 2WIRE Standard | 2AI I 4WIRE Standard | Range of values | Default setting | Applicability |
|---|--|--------------------------------------|--|--------------------|---------------|
| Group diagnosis (parameter assignment error, internal error) | | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Diagnostics: Overflow/underflow | | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Diagnostics: wire break ² | Diagnostics: wire break | Diagnostics: wire break ¹ | <ul style="list-style-type: none"> • disable • Enable | disable | Channel |
| Smoothing | | | <ul style="list-style-type: none"> • None • Weak • Medium • Strong | None | Channel |
| Type/range of measurement | --- | --- | <ul style="list-style-type: none"> • De-activated • ± 5 V • Up to 5 V • ± 10 V | ± 10 V | Channel |
| --- | Type/range of measurement | --- | <ul style="list-style-type: none"> • De-activated • 2 WIRE: 4 to 20 mA | 2 WIRE: 4 to 20 mA | Channel |
| --- | --- | Type/range of measurement | <ul style="list-style-type: none"> • De-activated • 4 WIRE: 4 to 20 mA • 4 WIRE: ± 20 mA | 4 WIRE: 4 to 20 mA | Channel |
| ¹ Only in the measuring range 4 mA to 20 mA ² Only in the measuring range 1 V to 5 V | | | | | |

See also

Connecting Thermocouples (Page 4-19)

4.5.2 Parameters for analog electronic modules 2AI U High Feature and 2AI I 2/4WIRE High Feature

Table 4-31 Parameters for analog electronic modules U, I High Feature

| 2AI U High Feature | 2AI I 2/4WIRE High Feature | Range of values | Default setting | Applicability |
|--|--------------------------------------|---|-----------------|---------------|
| Group diagnosis (parameter assignment error, internal error) | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Diagnostics: Overflow/underflow | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| --- | Diagnostics: Wire break ¹ | <ul style="list-style-type: none"> • disable • Enable | disable | Channel |
| Smoothing | | <ul style="list-style-type: none"> • None • Weak • Medium • Strong | None | Channel |
| Type/range of measurement | --- | <ul style="list-style-type: none"> • De-activated • ± 5 V • 1 V to 5 V • ± 10 V | ± 10 V | Channel |
| --- | Type/range of measurement | <ul style="list-style-type: none"> • De-activated • 4 to 20 mA • ± 20 mA | 4 to 20 mA | Channel |
| Interference frequency suppression | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Run-time calibration | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| ¹ Only in the measuring range 4 to 20 mA | | | | |

See also

Connecting Thermocouples (Page 4-19)

4.5.3 Parameters for analog electronic modules 2AI U High Speed, 2AI I 2WIRE High Speed and 2AI I 4WIRE High Speed

Table 4-32 Parameters for analog input modules U, I High Speed

| 2AI U High Speed | 2AI I 2WIRE High Speed | 2AI I 4WIRE High Speed | Range of values | Default setting | Applicability |
|--|---------------------------|---------------------------|--|-----------------|---------------|
| Group diagnosis (parameter assignment error, internal error) | | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Diagnostics: Overflow/underflow | | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| --- | Diagnostics: Wire break | Diagnostics: Wire break | <ul style="list-style-type: none"> • disable • Enable | disable | Channel |
| Smoothing | | | <ul style="list-style-type: none"> • None • Weak • Medium • Strong | None | Channel |
| Type/range of measurement | --- | --- | <ul style="list-style-type: none"> • De-activated • ± 10 V • ± 5 V • ± 2.5 V • Up to 5 V | ± 10 V | Channel |
| --- | Type/range of measurement | --- | <ul style="list-style-type: none"> • De-activated • 4 to 20 mA • 0 to 20 mA | 4 to 20 mA | Channel |
| --- | --- | Type/range of measurement | <ul style="list-style-type: none"> • De-activated • 4 to 20 mA • 0 to 20 mA • ± 20 mA | 4 to 20 mA | Channel |

Note

If you deactivate a channel of the HIGH SPEED modules, you do not achieve any speed advantage on account of the measuring procedure used.

See also

Connecting Thermocouples (Page 4-19)

4.5 Parameters for analog electronic modules

4.5.4 Parameters for analog electronic modules 2AI RTD Standard, 2AI TC Standard and 2AI TC High Feature

Table 4-33 Parameters for analog input modules RTD, TC

| 2AI RTD Standard | 2AI TC Standard | 2AI TC High Feature | Range of values | Default setting | Applicability |
|--|--|---------------------|---|-----------------|---------------|
| Group diagnosis (parameter assignment error, internal error) | | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Diagnostics: Overflow/underflow | | | <ul style="list-style-type: none"> • disable • Enable | disable | Module |
| Diagnostics: Wire break ² | Diagnostics: Wire break check ¹ | | <ul style="list-style-type: none"> • disable • Enable | disable | Channel |
| Smoothing | | | <ul style="list-style-type: none"> • None • Weak • Medium • Strong | None | Channel |
| | | Temperature unit | <ul style="list-style-type: none"> • Celsius • Fahrenheit | Celsius | Module |
| --- | Reference junction | --- | <ul style="list-style-type: none"> • None • RTD | None | Channel |
| --- | | Reference junction | <ul style="list-style-type: none"> • None • Yes (i.e. internal) | None | Channel |
| --- | Reference junction number | --- | <ul style="list-style-type: none"> • None • 1 to 8 (in the case of the IM151-1 STANDARD and IM151-1 FO STANDARD) • 1 (in the case of the IM151-1 BASIC, IM151-1 COMPACT, IM151-1 HIGH FEATURE) | None | Module |
| Type/range of measurement | --- | | <ul style="list-style-type: none"> • De-activated • 150 ohm • 300 ohm • 600 ohm • Pt100 Climatic • Ni100 Climatic Range • Pt100 Standard • Ni100 Standard | Pt100 Standard | Channel |

| 2AI RTD Standard | 2AI TC Standard | 2AI TC High Feature | Range of values | Default setting | Applicability |
|--|---------------------------|---------------------------|--|------------------------|---------------|
| --- | Type/range of measurement | --- | <ul style="list-style-type: none"> • De-activated • Voltage ± 80 mV • TC-EL type T (Cu-CuNi) • TC-EL type K (NiCr-Ni) • TC-EL type B (PtRh-PtRh) • TC-EL type N (NiCrSi-NiSi) • TC-EL type E (NiCr-CuNi) • TC-EL type R (PtRh-Pt) • TC-EL type S (PtRh-Pt) • TC-EL type J (Fe-Cu-Ni) • TC-EL type L (Fe-Cu-Ni) | TC-EL type K (NiCr-Ni) | Channel |
| | | Type/range of measurement | <ul style="list-style-type: none"> • De-activated • Voltage ± 80 mV • TC-EL type T (Cu-CuNi) • TC-EL type K (NiCr-Ni) • TC-EL type B (PtRh-PtRh) • TC-EL type C (WRe-WRe) • TC-EL type N (NiCrSi-NiSi) • TC-EL type E (NiCr-CuNi) • TC-EL type R (PtRh-Pt) • TC-EL type S (PtRh-Pt) • TC-EL type J (Fe-Cu-Ni) • TC-EL type L (Fe-Cu-Ni) | TC-EL type K (NiCr-Ni) | Channel |
| <p>¹ Only with thermocouples. A parameter assignment error occurs when the wire break diagnosis is enabled in the voltage measuring range. The module does not start up.</p> <p>² The wire break is only detected with constant-current lines.</p> | | | | | |

See also

Connecting Thermocouples (Page 4-19)

4.5 Parameters for analog electronic modules

4.5.5 Parameters for 2AI RTD High Feature analog electronic module

Table 4-34 Parameters for 2AI RTD High Feature analog electronic module

| Parameters | Range of values | Default setting | Applicability |
|---------------------------------|--|----------------------------|---------------|
| Group diagnostics | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Diagnostics: overflow/underflow | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Diagnostics: Wire break | <ul style="list-style-type: none"> • Disable¹ • Enable | Disable | Channel |
| Smoothing | <ul style="list-style-type: none"> • None • Weak • Medium • Strong | None | Channel |
| Temperature unit | <ul style="list-style-type: none"> • Celsius • Fahrenheit | Celsius | Module |
| Type of measurement | <ul style="list-style-type: none"> • De-activated • Four-wire resistor • Three-wire resistor • Two-wire resistor • Four-wire thermal resistor • Three-wire thermal resistor • Two-wire thermal resistor | Four-wire thermal resistor | Channel |
| Temperature coefficient | <ul style="list-style-type: none"> • Pt 0.003850 • Pt 0.003916 • Pt 0.003902 • Pt 0.003920 • Pt 0.003851 • Ni 0.006180 • Ni 0.006720 • Ni 0.005000 • Cu 0.00427 | Pt 0.003851 | Channel |
| Measuring range | <ul style="list-style-type: none"> • 150 Ω • 300 Ω • 600 Ω • 3000 Ω • PTC • Pt100 Climatic • Ni100 Climatic Range • Pt100 Standard • Ni100 Standard • Pt500 standard range • Pt1000 standard range • Ni1000 standard range • Pt200 climatic range • Pt500 climatic range | Pt100 Standard | Channel |

| Parameters | Range of values | Default setting | Applicability |
|--|--|-----------------|---------------|
| | <ul style="list-style-type: none"> • Pt1000 climatic range • Ni1000 climatic range • Pt200 standard range • Ni120 standard range • Ni120 climatic range • Cu10 climatic range • Cu10 standard range • Ni200 standard range • Ni200 climatic range • Ni500 standard range • Ni500 climatic range | | |
| ¹ Wire break diagnostic is disabled if - Type of measurement = "deactivated" or Measuring Range = "PTC" was assigned. | | | |

Type of measurement

The following table lists the temperature coefficients and measuring ranges you can set for each measurement type:

| Type of measurement | Temperature coefficient | Measuring range |
|---|--|--|
| De-activated | – | – |
| Four-wire resistor Three-wire resistor | – | 150 Ω / 300 Ω / 600 Ω / 3000 Ω |
| Two-wire resistor | – | 150 Ω / 300 Ω / 600 Ω / 3000 Ω / PTC |
| Three-wire thermal resistor | Pt 0.003850 / Pt 0.003916 / Pt 0.003902 / Pt 0.003920 / Pt 0.003851 ¹ | Pt100 climatic range / Pt100 standard range / Pt200 climatic range / Pt200 standard range / Pt500 climatic range / Pt500 standard range / Pt1000 climatic range / Pt1000 standard range |
| | Ni 0.006180 ¹ / Ni 0.006720 | Ni100 climatic range / Ni100 standard range / Ni120 climatic range / Ni120 standard range / Ni200 climatic range / Ni200 standard range / Ni500 climatic range / Ni500 standard range / Ni1000 climatic range / Ni1000 standard range |
| | Ni 0.005000 | Ni 1000 climatic range ² Ni 1000 standard range ² |
| | Cu 0.00427 ¹ | Cu10 climatic range / Cu10 standard range |

4.5 Parameters for analog electronic modules

| Type of measurement | Temperature coefficient | Measuring range |
|--|---|--|
| Two-wire thermal resistor Four-wire thermal resistor | Pt 0.003850 / Pt 0.003916 / Pt 0.003902 / Pt 0.003920 / Pt 0.003851 | Pt100 climatic range / Pt100 standard range / Pt200 climatic range / Pt200 standard range / Pt500 climatic range / Pt500 standard range / Pt1000 climatic range / Pt1000 standard range |
| | Ni 0.006180) / Ni 0.006720 | Ni100 climatic range / Ni100 standard range / Ni120 climatic range / Ni120 standard range / Ni200 climatic range / Ni200 standard range / Ni500 climatic range / Ni500 standard range / Ni1000 climatic range / Ni1000 standard range |
| | Ni 0.005000 | Ni 1000 climatic range ² Ni 1000 standard range ² |
| ¹ The default settings for the temperature coefficients are valid for Europe. ² For LG-Ni 1000 sensors from Siemens Building Ltd (Landis & Stäfa) | | |

Temperature coefficient

The correction factor for the temperature coefficient (α -value) specifies how much the resistance of a certain material changes when the temperature is raised by 1° C.

The temperature coefficient depends on the chemical composition of the material. Only one value is used in Europe for each type of sensor (default value).

Additional values enable you to make a sensor-specific setting for the temperature coefficient, therefore ensuring more accuracy.

See also

Connecting Thermocouples (Page 4-19)

4.5.6 Parameters for analog electronic modules 2AO U Standard, 2AO U High Feature and 2AO I Standard, 2AO I High Feature

Table 4-35 Parameters for analog output modules U, I

| 2AO U Standard, 2AO U High Feature | 2AO I Standard, 2AO I High Feature | Range of values | Default setting | Applicability |
|--|--|--|--|---------------|
| Group diagnosis (parameter assignment error, internal error) | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Diagnostics: Short-circuit to M | --- | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |
| --- | Diagnostics: Wire break | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |
| Reaction to CPU-/master-STOP | | <ul style="list-style-type: none"> • No output current and voltage • Substitute a value • Keep last value | No output current and voltage | Module |
| Type/range of output | --- | <ul style="list-style-type: none"> • De-activated • 1 V to 5 V • ± 10 V | ± 10 V | Channel |
| --- | Type/range of output | <ul style="list-style-type: none"> • De-activated • 4 to 20 mA • ± 20 mA | 4 to 20 mA | Channel |
| Substitute value ¹ | | To 65535 (value range must be within the nominal range) | ± 10 V: 0 V ± 20 mA: 0 mA 4 mA to 20 mA: 4 mA 1 V to 5 V: 1 V | Channel |

¹ If there is no voltage going to the interface module or COMPACT module but the supply to the analog output modules continues, the substitute values that have been assigned parameters are output. Substitute values must be within the nominal range. You can assign as parameters values from -27648 to +27648 (in the case of parameter assignment by means of the device database file).

See also

Connecting Thermocouples (Page 4-19)

4.5.7 Parameters of the Analog Electronic Modules

Smoothing

The individual measured values are smoothed by digital filtering. The smoothing can be adjusted in four steps, in which the smoothing factor k multiplied with cycle time of the electronic module equals the time constant of the smoothing filter. The higher the smoothing the greater the time constant of the filter.

The following diagrams show the step response with the various smoothing factors depending on the number of subassembly cycles.

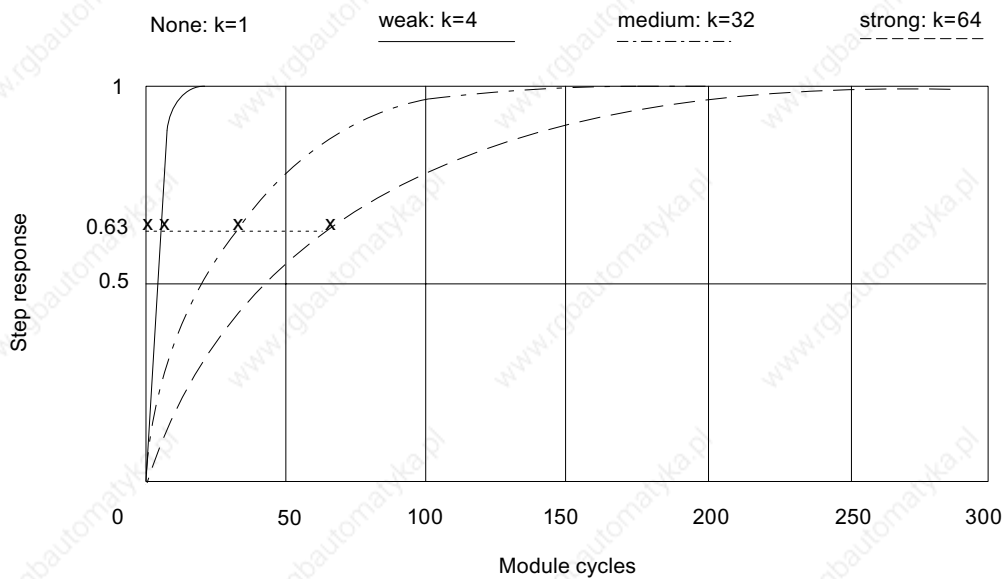


Figure 4-3 Smoothing with the 2AI U Standard, 2AI U High Feature, 2AI I 2WIRE Standard, 2AI I 4WIRE Standard, 2AI I 2/4WIRE High Feature, 2AI RTD Standard, 2AI RTD High Feature, 2AI TC Standard, 2AI TC High Feature

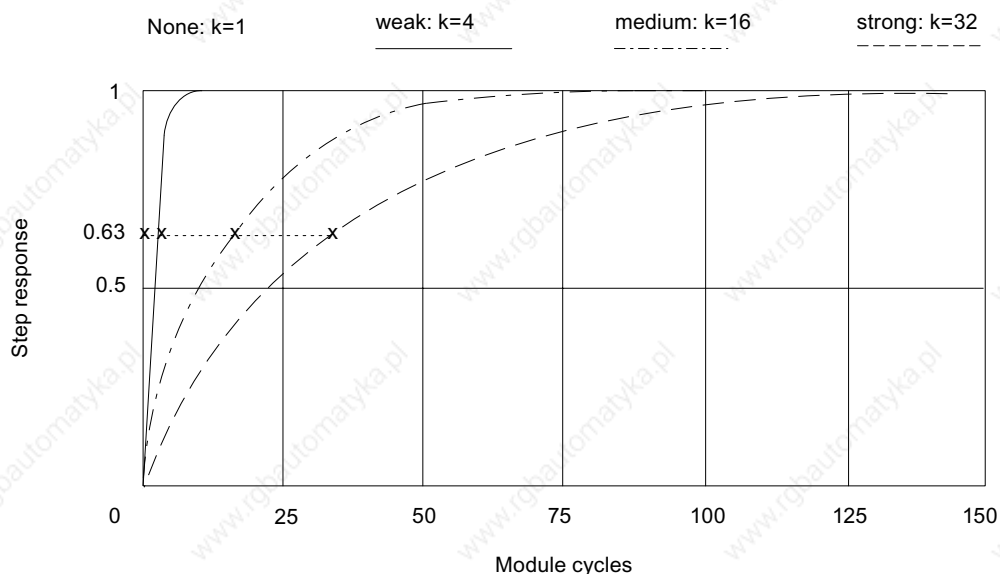


Figure 4-4 Smoothing with 4AI I 2WIRE Standard

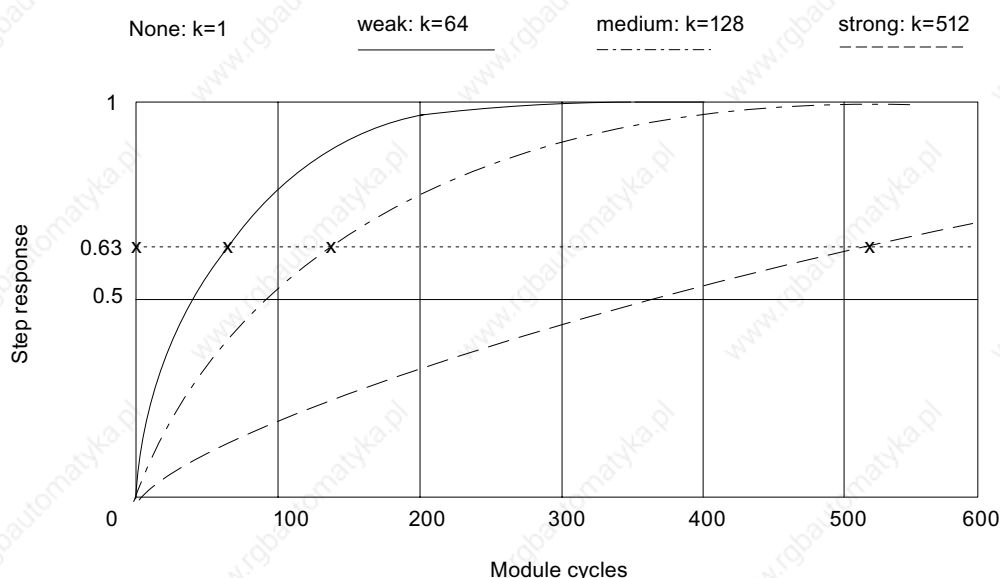


Figure 4-5 Smoothing with 2AI U High Speed, 2AI I 2WIRE High Speed, 2AI I 4WIRE High Speed

Interference frequency suppression

The analog input modules 2AI U High Feature and 2AI I 2/4WIRE High Feature support the setting of the interference frequency suppression (50 Hz or 60 Hz) at the interface module. These analog input modules (HIGH FEATURE) also allow the interference frequency suppression to be disabled; i.e., this setting can be ignored on the interface module. If the interference suppression is disabled, the conversion and cycle times in these modules are improved.

4.6 2AI U Standard analog electronic module (6ES7134-4FB01-0AB0)

Run-time calibration

- 2AI U High Feature

When setting the module parameters the runtime calibration for the 2AI U High Feature analog electronic module can be enabled to compensate for component drift resulting from changes in the ambient temperature. During the calibration interval, the updating of new data is delayed by 250 ms. Calibration takes place each time the ambient temperature changes by 5 °C.

- 2AI I 2/4WIRE High Feature

When setting the module parameters a runtime calibration for the 2AI I 2/4WIRE High Feature analog electronic module can be enabled for periodic compensation of the offset voltage drift of the A/D converter. During the calibration interval, the updating of new data is delayed by 200 ms. The accuracy limits of the module will be met without run-time calibration.

Reference Junction, Reference Junction Number

See *Connection of thermocouples*.

See also

Connecting Thermocouples (Page 4-19)

4.6 2AI U Standard analog electronic module (6ES7134-4FB01-0AB0)

Properties

- 2 inputs for measuring voltage
- Input ranges:
 - ± 10 V, resolution 13 bits + sign
 - ± 5 V, resolution 13 bits + sign
 - 1 to 5 V, resolution 13 bits
- Isolated from the load voltage L+
- Permissible common mode voltage AC 2 V_{SS}

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

4.6 2AI U Standard analog electronic module (6ES7134-4FB01-0AB0)

| Terminal assignment for 2AI U Standard (6ES7134-4FB01-0AB0) | | | | |
|---|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n M_{ana}: Ground of the module n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI U Standard (6ES7134-4FB01-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

4.6 2AI U Standard analog electronic module (6ES7134-4FB01-0AB0)

Block diagram

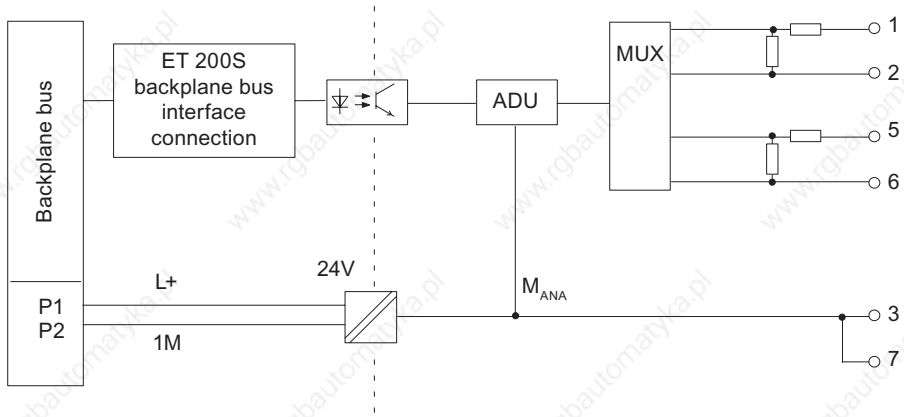


Figure 4-6 Block diagram of the 2AI U Standard

2AI U Standard Technical Specifications (6ES7134-4FB01-0AB0)

| Dimensions and Weight | |
|--|---------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between the inputs and M _{ANA} (U _{CM}) | 2 V _{ACSS} |
| • Between M _{ANA} and the central grounding point (U _{ISO}) | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 30 mA |
| Power dissipation of the module | Typically 0.6 W |
| Status, interrupts, diagnostics | |

4.6 2AI U Standard analog electronic module (6ES7134-4FB01-0AB0)

| | |
|---|---|
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |
| Analog value generation | |
| Measuring principle | Integrative |
| Integration and cycle time/resolution per channel: | |
| • Integration time can be assigned parameters | Yes |
| • Interference frequency suppression in Hz | 60 50 |
| • Integration time in milliseconds | 16.7 20 |
| • Conversion time in ms | 55 65 |
| • Cycle time in ms | Number of active channels per module x conversion time |
| • Resolution (including overrange) | ± 10 V/13 bits + sign ± 5 V/13 bits + sign 1 V to 5 V/13 bits |
| Suppression of interference, limits of error | |
| Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, ($f_1 =$ interference frequency) | |
| • Common-mode interference (U_{SS}) • Series-mode interference (peak interference value < rated value of input range) • Crosstalk between the inputs | min. 90 dB min. 70 dB min. -50 dB |
| Operational limit (in the entire temperature range, with reference to the input range) | ± 0.6 % |
| Basic error limit (operational limit at 25° C with reference to input range) | ± 0.4 % |
| Temperature error (with reference to the input range) | ± 0.01 %/K |
| Linearity error (with reference to the input range) | ± 0.01 % |
| Repeatability (in steady state at 25° C with reference to input range) | ± 0.05 % |

4.7 2AI U High Feature analog electronic module (6ES7134-4FB00-0AB0)

| Data for selecting a sensor | | |
|---|---|--|
| Input range (rated value)/input resistance | | |
| • Voltage | ± 5 V/min. 100 k Ω 1 V to 5 V/min. 100 k Ω ± 10 V/min. 100 k Ω | |
| Permitted input voltage (destruction limit) | 35 V continuous, 75 V at max. duration of 1 ms (sampling ratio 1:20) | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step None Weak Medium Strong | Time constant 1 x cycle time 4 x cycle time 32 x cycle time 64 x cycle time |

4.7 2AI U High Feature analog electronic module (6ES7134-4FB00-0AB0)

Properties

- 2 inputs for measuring voltage
- Input ranges:
 - ± 10 V, resolution 15 bits + sign
 - ± 5 V, resolution 15 bits + sign
 - 1 V to 5 V, resolution 15 bits
- Isolated from the load voltage L+
- Permitted common-mode voltage between the channels 100 VAC

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

4.7 2AI U High Feature analog electronic module (6ES7134-4FB00-0AB0)

| Terminal assignment for 2AI U High Feature (6ES7134-4FB00-0AB0) | | | | |
|---|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | n.c. | 7 | n.c. | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI U High Feature (6ES7134-4FB00-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

4.7 2AI U High Feature analog electronic module (6ES7134-4FB00-0AB0)

Block diagram

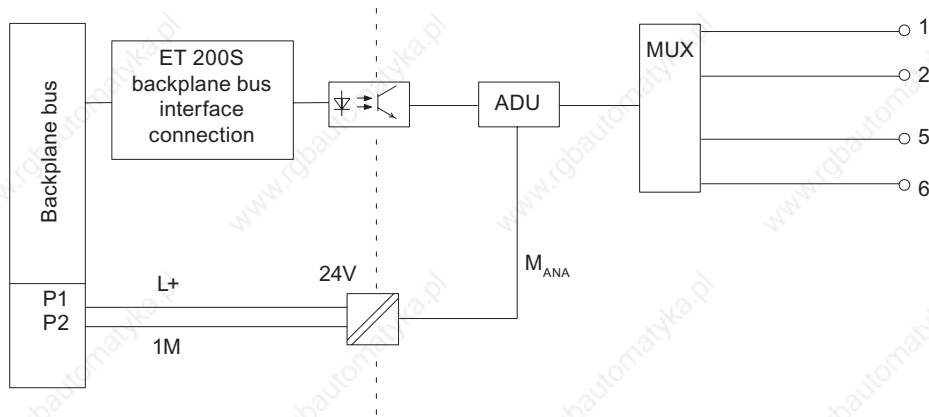


Figure 4-7 Block diagram of the 2AI U High Feature

2AI U High Feature Technical Specifications (6ES7134-4FB00-0AB0)

| Dimensions and Weight | |
|--|-------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels and PE | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between the channels | 140 VDC / 100 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 53 mA |
| Power dissipation of the module | Typically 0.85 W |
| Status, interrupts, diagnostics | |

4.7 2AI U High Feature analog electronic module (6ES7134-4FB00-0AB0)

| | | | |
|---|---|-----|-----|
| Diagnostics function | | | |
| • Group error | Red "SF" LED | | |
| • Diagnostic functions readable (wire break diagnosis is not supported on the module.) | Yes | | |
| Analog value generation | | | |
| Measuring principle | Integrative | | |
| Integration and cycle time/resolution per channel | | | |
| • Integration time can be assigned parameters | Yes | | |
| • Interference frequency suppression in Hz | 60 | 50 | no |
| • Integration time in milliseconds | 16.67 | 20 | 7.5 |
| • Conversion time in ms | | | |
| – 1 channel active per module | 25 | 30 | 10 |
| – 2 channels active per module | 58.3 | 70 | 26 |
| • Cycle time in ms | | | |
| – 1 channel active per module | 75 | 90 | 30 |
| – 2 channels active per module | 175 | 210 | 78 |
| • Resolution (including overrange) | ± 10 V/15 bits + sign ± 5 V/15 bits + sign 1 V to 5 V/15 bits | | |
| Suppression of interference, limits of error | | | |
| Interference voltage suppression for $f = n \times (f_1 \pm 0.5 \%)$, (f_1 = interference frequency) | | | |
| • Common-mode interference (U_{SS}) | min. 100 dB | | |
| • Series-mode interference | min. 90 dB | | |
| (peak interference value < rated value of input range) | | | |
| • Crosstalk between the inputs | min. -100 dB | | |
| Operational limit (entire temperature range with reference to input range; calibration enabled ¹) | ± 0.1 % | | |
| Operational limit (entire temperature range with reference to input range; calibration disabled) | ± 0.5% | | |
| Basic error limit (operational limit at 25° C with reference to input range; calibration enabled ¹) | ± 0.05% | | |
| Temperature error (with reference to input range; calibration enabled ¹) | ± 0.003 %/K | | |
| Temperature error (with reference to input range; calibration disabled) | ± 0.015 %/K | | |
| Linearity error (with reference to the input range) | ± 0.03% | | |
| Repeatability (in steady state at 25° C with reference to input range) | ± 0.01% | | |
| Data for selecting a sensor | | | |

4.8 2AI U High Speed analog electronic module (6ES7134-4FB51-0AB0)

| | | |
|---|---|--|
| Input range (rated value)/input resistance | | |
| • Voltage | ± 10 V/min. 1 M Ω ± 5 V/min. 1 M Ω 1 V to 5 V/min. 1 M Ω | |
| Permitted input voltage (destruction limit) | 35 V continuous, 75 V at max. duration of 1 ms | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step None Weak Medium Strong | Time constant 1 x cycle time 4 x cycle time 32 x cycle time 64 x cycle time |
| ¹ Run-time calibration can be enabled during module parameter assignment to adjust for component drift due to changes in ambient temperature. During the calibration interval, the updating of new data is delayed by 250 ms. Calibration takes place each time the ambient temperature changes by 5 °C. | | |

4.8 2AI U High Speed analog electronic module (6ES7134-4FB51-0AB0)

Properties

- 2 inputs for measuring voltage
- Input ranges:
 - ± 10 V, resolution 13 bits + sign
 - ± 5 V, resolution 13 bits + sign
 - ± 2.5 V, resolution 13 bits + sign
 - 1 to 5 V, resolution 13 bits
- Isolated from the load voltage L+
- Permissible common mode voltage 100 VAC_{SS}
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 2.5 ms
 - Minimum conversion time of the input modules (T_{WEmin}): 1.1 ms

General terminal assignment

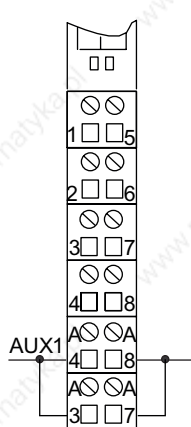
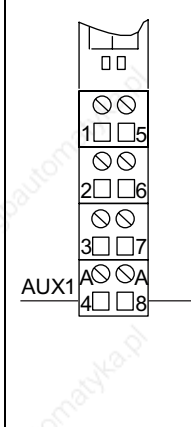
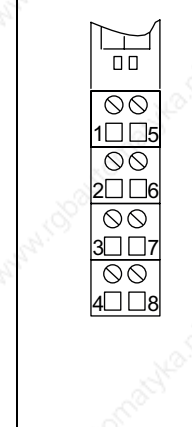
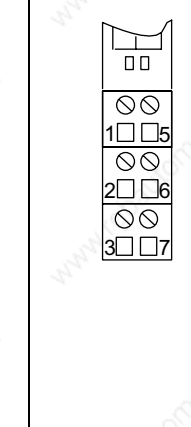
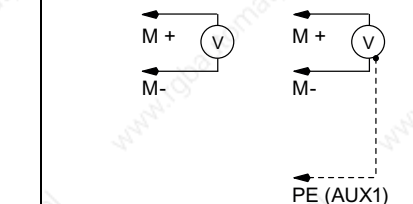
Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

4.8 2AI U High Speed analog electronic module (6ES7134-4FB51-0AB0)

| Terminal assignment for 2AI U High Speed (6ES7134-4FB51-0AB0) | | | | |
|---|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n M_{ana}: Ground of the module n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI U High Speed (6ES7134-4FB51-0AB0) | | | | |
|---|---|---|---|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Wiring examples</p>  |

4.8 2AI U High Speed analog electronic module (6ES7134-4FB51-0AB0)

Block diagram

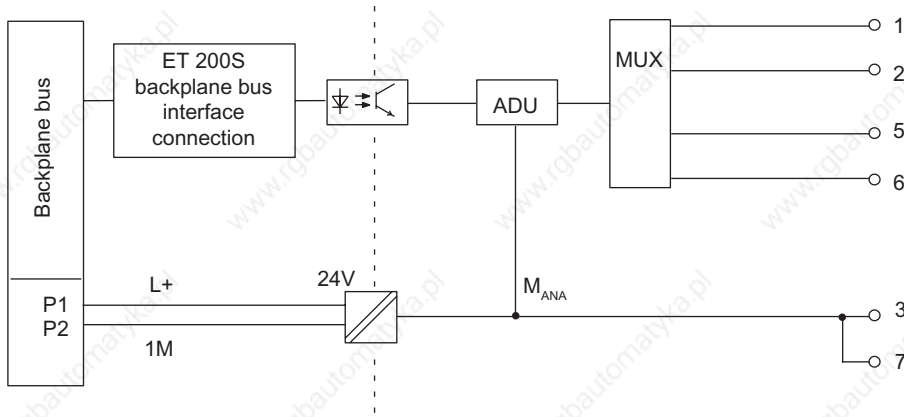


Figure 4-8 Block diagram of the 2AI U High Speed

2AI U High Speed Technical Specifications (6ES7134-4FB51-0AB0)

| Dimensions and Weight | |
|--|---|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 12 bytes (4 bytes when used as 6ES7134 4FB50-0AB0) |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between the inputs and M _{ANA} (U _{CM}) | 100 VAC _{SS} |
| • Between M _{ANA} and the central grounding point (U _{ISO}) | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |

4.8 2AI U High Speed analog electronic module (6ES7134-4FB51-0AB0)

| | |
|---|---|
| • Power supply and load voltage L+ (no load) | max. 35 mA |
| Power dissipation of the module | Typically 0.8 W |
| Status, interrupts, diagnostics | |
| Interrupts | |
| • Hardware interrupt | Can be assigned parameters ¹ |
| Diagnostics function | |
| • Group error display | Red "SF" LED |
| • Diagnostic information can be displayed | Possible ² |
| Analog value generation | |
| Measuring principle | Instantaneous value encoding |
| Cycle time/resolution: | |
| • Conversion time in ms (per channel) | 0.1 |
| • Cycle time in ms (per module) | 1 |
| • Resolution (including overrange) | ± 10 V/13 bits + sign ± 5 V/13 bits + sign ± 2.5 V/13 bits + sign 1 V to 5 V/13 bits |
| Suppression of interference, limits of error | |
| • Common mode interference ($U_{cm} < 100$ VSS) | > 70 dB |
| Crosstalk between the inputs | > 50 dB |
| Operational limit (in the entire temperature range, with reference to the input range) | ± 0.3% |
| Basic error limit (operational limit at 25° C with reference to input range) | ± 0.2% |
| Temperature error (with reference to the input range) | ± 0.01 %/K |
| Linearity error (with reference to the input range) | ± 0.01% |
| Repeatability (in steady state at 25° C with reference to input range) | ± 0.05% |

4.9 2AI I 2WIRE Standard analog electronic module (6ES7134-4GB01-0AB0)

| Data for selecting a sensor | | | | | | | | | | | |
|--|--|------|---------------|------|----------------|------|-----------------|--------|------------------|--------|------------------|
| Input ranges (rated value)/input resistance | | | | | | | | | | | |
| <ul style="list-style-type: none"> Voltage | ± 10 V/min. 100 kΩ ± 5 V/min. 100 kΩ ± 2.5 V/min. 100 kΩ 1 V - 5 V/min. 100 kΩ | | | | | | | | | | |
| Maximum input voltage for voltage input (destruction limit) | 50 V continuous, 100 V at max. duration of 1 ms (sampling ratio 1:20) | | | | | | | | | | |
| Connection of the sensors | | | | | | | | | | | |
| <ul style="list-style-type: none"> For measuring voltage | supported | | | | | | | | | | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>64 x cycle time</td> </tr> <tr> <td>Medium</td> <td>128 x cycle time</td> </tr> <tr> <td>Strong</td> <td>512 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 64 x cycle time | Medium | 128 x cycle time | Strong | 512 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 64 x cycle time | | | | | | | | | | |
| Medium | 128 x cycle time | | | | | | | | | | |
| Strong | 512 x cycle time | | | | | | | | | | |
| ¹ DPV1 only ² Parameter assignment error Violation of lower limit value Violation of upper limit value Open circuit (only with 1 V to 5 V) Process interrupt lost | | | | | | | | | | | |

4.9 2AI I 2WIRE Standard analog electronic module (6ES7134-4GB01-0AB0)

Properties

- 2 inputs for measuring current
- Input range:
4 to 20 mA, resolution 13 bits

General terminal assignment

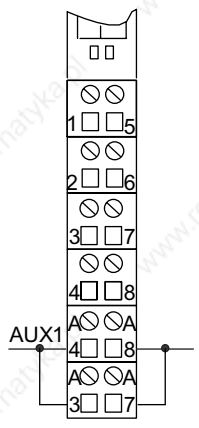
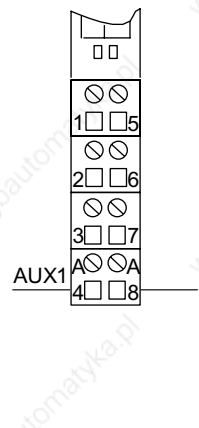
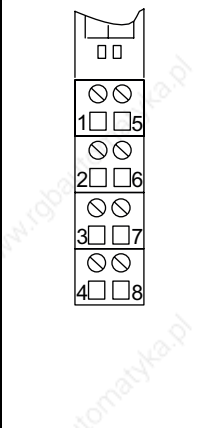
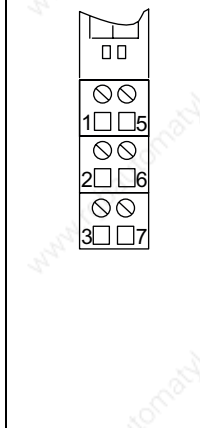
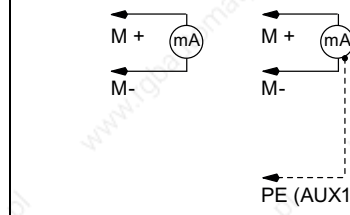
Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

4.9 2AI I 2WIRE Standard analog electronic module (6ES7134-4GB01-0AB0)

| Terminal assignment for 2AI I 2WIRE Standard (6ES7134-4GB01-0AB0) | | | | |
|---|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n M_{ana}: Ground (of power module) n.c.: Not connected (max. DC 30 V can be connected) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI I 2WIRE Standard (6ES7134-4GB01-0AB0) | | | | |
|---|---|---|--|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Wiring examples</p>  <p>2-wire measuring transducer is supplied by means of the measuring circuits.</p> |

Block diagram

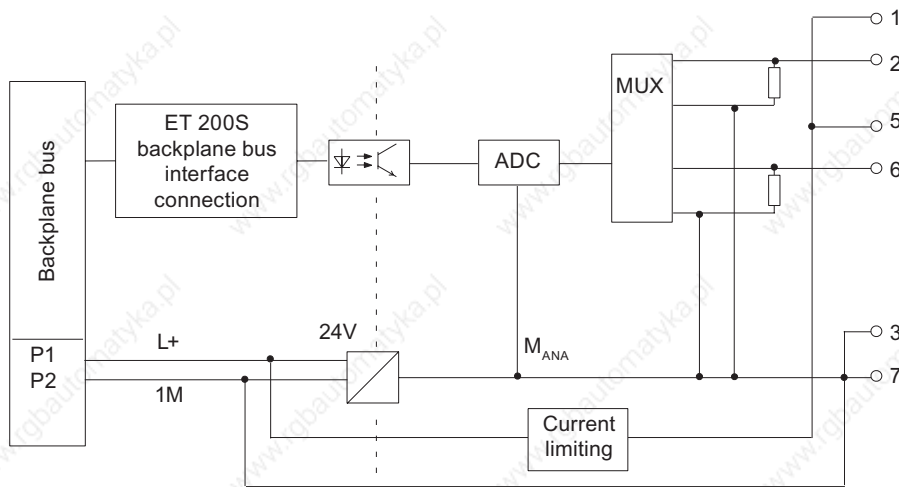


Figure 4-9 Block diagram of the 2AI I 2WIRE Standard

2AI I 2WIRE Standard Technical Specifications (6ES7134-4GB01-0AB0)

| Dimensions and Weight | |
|--|--|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Power supply of the transmitters | Yes |
| • Short-circuit protection | Yes, (destruction limit 35 mA per channel) |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | no |
| • Between the channels | no |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 80 mA |
| Power dissipation of the module | Typically 0.6 W |

4.9 2AI / 2WIRE Standard analog electronic module (6ES7134-4GB01-0AB0)

| Status, interrupts, diagnostics | | |
|--|--|----|
| Diagnostics function | | |
| • Group error | Red "SF" LED | |
| • Diagnostic functions readable | Yes | |
| Analog value generation | | |
| Measuring principle | Integrative | |
| Integration and cycle time/resolution per channel: | | |
| • Integration time can be assigned parameters | Yes | |
| • Interference frequency suppression in Hz | 60 | 50 |
| • Integration time in milliseconds | 16.7 | 20 |
| • Conversion time in ms | 55 | 65 |
| • Cycle time in ms | Number of active channels per module x conversion time | |
| • Resolution (including overrange) | 4 mA to 20 mA/13 bits | |
| Suppression of interference, limits of error | | |
| Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, ($f_1 =$ interference frequency) | | |
| • Common mode interference (peak value of interference < rated value of input range) | min. 70 dB | |
| Crosstalk between the inputs | min. -50 dB | |
| Operational limit (in the entire temperature range, with reference to the input range) | $\pm 0.6\%$ | |
| Basic error limit (operational limit at 25° C with reference to input range) | $\pm 0.4\%$ | |
| Temperature error (with reference to the input range) | $\pm 0.005 \%/K$ | |
| Linearity error (with reference to the input range) | $\pm 0.01\%$ | |
| Repeatability (in steady state at 25° C with reference to input range) | $\pm 0.05\%$ | |

4.10 4AI I 2WIRE Standard analog electronic module (6ES7134-4GD00-0AB0)

| Data for selecting a sensor | | |
|---|--|--|
| Input range (rated value)/input resistance | | |
| • Current | 4 mA to 20 mA/50 Ω | |
| Permitted input current (destruction limit) | 40 mA | |
| Load of the two-wire measuring transducer | max. 750 Ω | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step None Weak Medium Strong | Time constant 1 x cycle time 4 x cycle time 32 x cycle time 64 x cycle time |

4.10 4AI I 2WIRE Standard analog electronic module (6ES7134-4GD00-0AB0)

Properties

- 4 inputs for measuring current
- Input range:
4 to 20 mA, resolution 13 bits

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 4AI I 2WIRE Standard (6ES7134-4GD00-0AB0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Input signal "+", channel n • M_{n-}: Input signal "-", channel n • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | M ₂₊ | 7 | M ₃₊ | |
| 4 | M ₂₋ | 8 | M ₃₋ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

4.10 4AI I 2WIRE Standard analog electronic module (6ES7134-4GD00-0AB0)

Usable terminal modules

| Usable terminal modules for 4AI I 2WIRE Standard (6ES7134-4GD00-0AB0) | | |
|---|--------------------------------------|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | <p>Wiring examples</p> <p>2-wire measuring transducer is supplied by means of the measuring circuits.</p> |

Block diagram

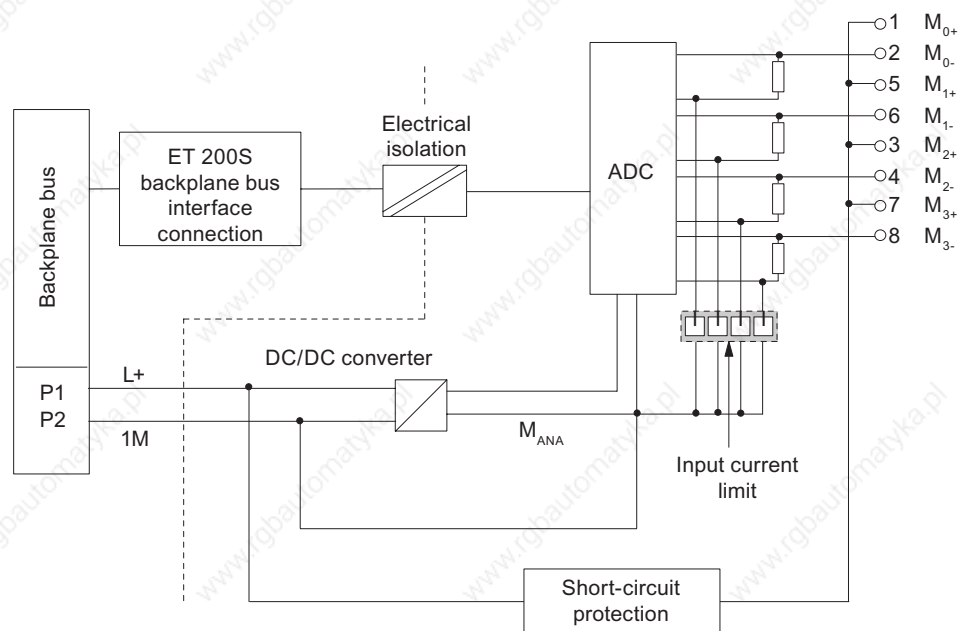


Figure 4-10 Block diagram of the 4AI I 2WIRE Standard

4AI I 2WIRE Standard Technical Specifications (6ES7134-4GD00-0AB0)

| Dimensions and Weight | | |
|--|---------------------------------|----|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 | |
| Weight | Approx. 40 g | |
| Data for specific modules | | |
| Supports isochronous operation | no | |
| Number of inputs | 4 | |
| Cable length | | |
| • Shielded | max. 200 m | |
| Parameter length | 7 bytes | |
| Voltages, currents, potentials | | |
| Rated load voltage L+ (from the power module) | 24 VDC | |
| • Reverse polarity protection | Yes | |
| Power supply of the transmitters | Yes | |
| • Short-circuit protection | Yes (approx. 200 mA for module) | |
| Galvanic isolation | | |
| • Between the channels and backplane bus | Yes | |
| • Between the channels and load voltage L+ | no | |
| • Between the channels | no | |
| Insulation tested | 500 VDC | |
| Current consumption of the module | | |
| • From the load voltage L+ (with sensor supply) | max. 125 mA | |
| Power dissipation of the module | Typically 0.6 W | |
| Status, interrupts, diagnostics | | |
| Diagnostics function | | |
| • Group error | Red "SF" LED | |
| • Diagnostic functions readable | Yes | |
| Analog value generation | | |
| Measuring principle | Integrative | |
| Integration and cycle time/resolution per channel: | | |
| • Integration time can be assigned parameters | Yes | |
| • Interference frequency suppression in Hz | 60 | 50 |
| • Integration time in milliseconds | 16.7 | 20 |
| • Cycle time per module in ms | 33 | 40 |
| • Resolution (including overrange) | 4 mA to 20 mA/13 bits | |

4.10 4AI / 2WIRE Standard analog electronic module (6ES7134-4GD00-0AB0)

| Suppression of interference, limits of error | | | | | | | | | | | |
|---|---|------|---------------|------|----------------|------|----------------|--------|-----------------|--------|-----------------|
| Interference voltage suppression for $f = n \times (f_1 \pm 1\%)$, ($f_1 =$ interference frequency) | | | | | | | | | | | |
| <ul style="list-style-type: none"> Common mode interference (peak value of interference < rated value of input range) | min. 70 dB | | | | | | | | | | |
| Crosstalk between the inputs | min. -50 dB | | | | | | | | | | |
| Operational limit (in the entire temperature range, with reference to the input range) | $\pm 0.4\%$ | | | | | | | | | | |
| Basic error limit (operational limit at 25° C with reference to input range) | $\pm 0.3\%$ | | | | | | | | | | |
| Temperature error (with reference to the input range) | $\pm 0.003\%/K$ | | | | | | | | | | |
| Linearity error (with reference to the input range) | $\pm 0.01\%$ | | | | | | | | | | |
| Repeatability (in steady state at 25° C with reference to input range) | $\pm 0.05\%$ | | | | | | | | | | |
| Data for selecting a sensor | | | | | | | | | | | |
| Input range (rated value)/input resistance | | | | | | | | | | | |
| <ul style="list-style-type: none"> Current | 4 mA to 20 mA/25 Ω | | | | | | | | | | |
| Permitted input current (destruction limit) | Approx. 30 mA (limited electronically) | | | | | | | | | | |
| Load of the two-wire measuring transducer | max. 750 Ω | | | | | | | | | | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>4 x cycle time</td> </tr> <tr> <td>Medium</td> <td>16 x cycle time</td> </tr> <tr> <td>Strong</td> <td>32 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 4 x cycle time | Medium | 16 x cycle time | Strong | 32 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 4 x cycle time | | | | | | | | | | |
| Medium | 16 x cycle time | | | | | | | | | | |
| Strong | 32 x cycle time | | | | | | | | | | |

4.11 2AI I 2WIRE High Speed analog electronic module (6ES7134-4GB51-0AB0)

Properties

- 2 inputs for measuring current
- Current-limited sensor supply (90 mA)
- Input ranges:
 - 4 to 20 mA, resolution 13 bits
 - 0 to 20 mA, resolution 13 bits
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 2.5 ms
 - Minimum conversion time of the input modules (T_{WEmin}): 1.1 ms

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI I 2WIRE High Speed (6ES7134-4GB51-0AB0) | | | | |
|---|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Input signal "+", channel n • M_{n-}: Input signal "-", channel n • M_{ana}: Ground (of power module) • n.c.: Not connected (max. DC 30 V can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI I 2WIRE High Speed (6ES7134-4GB51-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 | TM-E15N24-A1 | TM-E15N24-01 | TM-E15N23-01 | |

4.11 2AI | 2WIRE High Speed analog electronic module (6ES7134-4GB51-0AB0)

| Usable terminal modules for 2AI 2WIRE High Speed (6ES7134-4GB51-0AB0) | | | | |
|---|----------------------|----------------------|----------------------|---|
| (6ES7193-4CA80-0AA0) | (6ES7193-4CA70-0AA0) | (6ES7193-4CB70-0AA0) | (6ES7193-4CB60-0AA0) | Fast Connect |
| | | | | <p>Wiring examples</p> <p>2-wire measuring transducer is supplied by means of the measuring circuits.</p> |

Block diagram

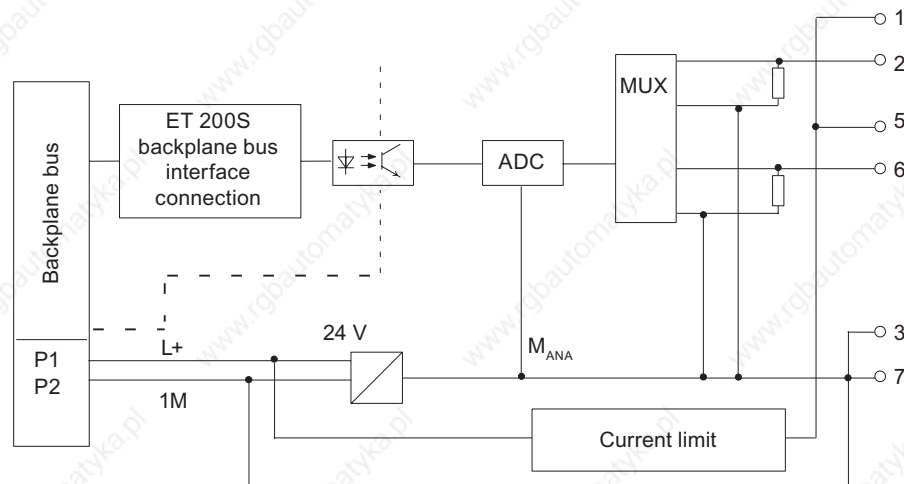


Figure 4-11 Block diagram of the 2AI | 2WIRE High Speed

2AI | 2WIRE High Speed Technical Specifications (6ES7134-4GB51-0AB0)

| Dimensions and Weight | |
|--|--------------|
| Dimensions W x H x D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of inputs | 2 |

4.11 2AI | 2WIRE High Speed analog electronic module (6ES7134-4GB51-0AB0)

| | |
|---|---|
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 12 bytes (4 bytes when used as 6ES7134 4FB50 0AB0) |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| • Short-circuit protection | Yes, (destruction limit 35 mA per channel) |
| Galvanic isolation | |
| • Between channels and backplane bus | Yes |
| • Between channels and load voltage L+ | no |
| • Between the channels | no |
| Permissible potential difference | |
| • Between M _{ANA} and M _{internal} (U _{ISO}) | 75 VDC, 60 VAC |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • Supply and load voltage L+ | max. 35 mA ¹ |
| Power dissipation of the module | Typically 0.8 W |
| Status, interrupts, diagnostics | |
| Interrupts | |
| • Hardware interrupt | Can be assigned parameters ² |
| Diagnostics function | |
| • Group error display | Red "SF" LED |
| • Diagnostic functions readable | Possible ³ |
| Analog value generation | |
| Measuring principle | Instantaneous value encoding |
| Cycle time/resolution: | |
| • Conversion time in ms (per channel) | 0.1 |
| • Cycle time in ms (per module) | 1 |
| • Resolution (including overrange) | 4 mA to 20 mA/13 bits 0 mA to 20 mA/13 bits |
| Suppression of interference, limits of error | |
| Crosstalk between the inputs | > 50 dB |
| Operational limit (in the entire temperature range, with reference to the input range) | ±0.3% |
| Basic error limit (operational limit at 25° C with reference to input range) | ± 0.2% |
| Temperature error (with reference to the input range) | ± 0.01 %/K |
| Linearity error (with reference to the input range) | ± 0.01% |
| Repeatability (in steady state at 25° C with reference to input range) | ± 0.05% |
| Sensor power supply outputs | |

4.11 2AI / 2WIRE High Speed analog electronic module (6ES7134-4GB51-0AB0)

| | | |
|--|--|---|
| Number of outputs | 2 | |
| Output voltage | L+ (-2.5 V) | |
| • With load | | |
| Output current | 90 mA (both channels) | |
| • Rated value | 0 mA to 90 mA | |
| • Permitted range | | |
| Short-circuit protection | Yes, electronic | |
| Data for selecting a sensor | | |
| Input range (rated value/input resistance) | | |
| • Current | 4 mA to 20 mA/50 Ω | |
| | 0 mA to 20 mA/50 Ω | |
| Connection of the sensors | | |
| • For current measurement as two-wire transmitter | supported | |
| Load of the two-wire measuring transducer | max. 670 Ω | |
| Permitted input current (destruction limit) | 60 mA | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step None Weak Medium Strong | Time constant 1 x cycle time 64 x cycle time 128 x cycle time 512 x cycle time |
| ¹ Without encoder supply voltage ² DPV1 only ³ Parameter assignment error Violation of lower limit value Violation of upper limit value Open circuit (only with 4 mA to 20 mA) Process interrupt lost | | |

4.12 2AI | 4WIRE Standard analog electronic module (6ES7134-4GB11-0AB0)

Properties

- 2 inputs for measuring current
- Input ranges:
 - ± 20 mA, resolution 13 bits + sign
 - 4 to 20 mA, resolution 13 bits
- Permissible common mode voltage 2 VAC_{ss}

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI 4WIRE Standard (6ES7134-4GB11-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Input signal "+", channel n • M_{n-}: Input signal "-", channel n • L+ Power supply for four-wire measuring transducer • M_{ana}: Ground (of power module) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | L+ | 7 | L+ | |
| 4 | M _{ana} | 8 | M _{ana} | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI I 4WIRE Standard (6ES7134-4GB11-0AB0) | | |
|---|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | |

Block diagram

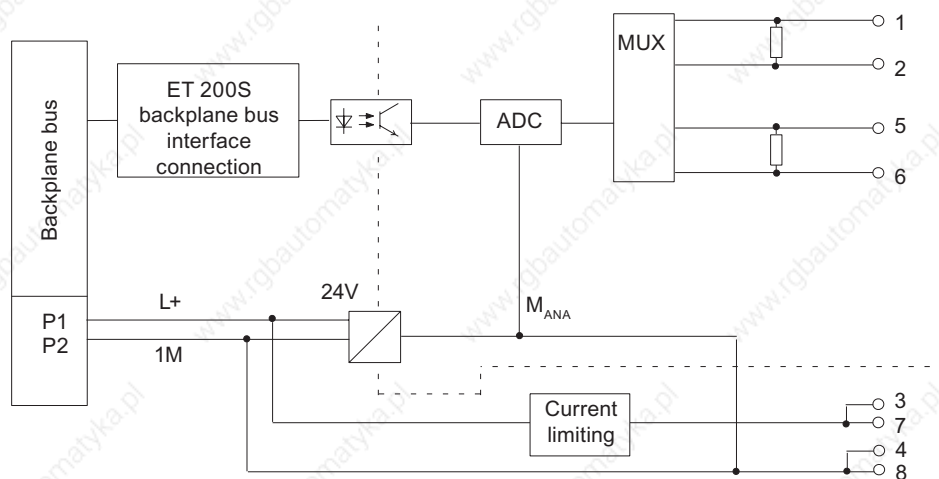


Figure 4-12 Block diagram of the 2AI I 4WIRE Standard

2AI I 4WIRE Standard Technical Specifications (6ES7134-4GB11-0AB0)

| Dimensions and Weight | |
|--|--|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Power supply of the transmitters | Yes |
| • Short-circuit protection | Yes, 60 mA (for both channels) |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | no |
| • Between the channels | no |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 30 mA |
| Power dissipation of the module | Typically 0.6 W |
| Status, interrupts, diagnostics | |
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |
| Analog value generation | |
| Measuring principle | Integrative |
| Integration and cycle time/resolution per channel: | |
| • Integration time can be assigned parameters | Yes |
| • Interference frequency suppression in Hz | 60 50 |
| • Integration time in milliseconds | 16.7 20 |
| • Conversion time in ms | 55 65 |
| • Cycle time in ms | Number of active channels per module x conversion time |
| • Resolution (including overrange) | ± 20 mA/13 bits + sign 4 mA to 20 mA/13 bits |

4.12 2AI / 4WIRE Standard analog electronic module (6ES7134-4GB11-0AB0)

| Suppression of interference, limits of error | | | | | | | | | | | |
|---|---|------|---------------|------|----------------|------|----------------|--------|-----------------|--------|-----------------|
| Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, ($f_1 =$ interference frequency) | | | | | | | | | | | |
| <ul style="list-style-type: none"> Common mode interference (peak value of interference < rated value of input range) | min. 70 dB | | | | | | | | | | |
| Crosstalk between the inputs | min. - 50 dB | | | | | | | | | | |
| Operational limit (in the entire temperature range, with reference to the input range) | $\pm 0.6\%$ | | | | | | | | | | |
| Basic error limit (operational limit at 25° C with reference to input range) | $\pm 0.4\%$ | | | | | | | | | | |
| Temperature error (with reference to the input range) | $\pm 0.005 \%/K$ | | | | | | | | | | |
| Linearity error (with reference to the input range) | $\pm 0.01\%$ | | | | | | | | | | |
| Repeatability (in steady state at 25° C with reference to input range) | $\pm 0.05\%$ | | | | | | | | | | |
| Data for selecting a sensor | | | | | | | | | | | |
| Input range (rated value)/input resistance | | | | | | | | | | | |
| <ul style="list-style-type: none"> Current | $\pm 20 \text{ mA}/50 \Omega$ 4 mA to 20 mA/50 Ω | | | | | | | | | | |
| Permitted input current (destruction limit) | 40 mA | | | | | | | | | | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>4 x cycle time</td> </tr> <tr> <td>Medium</td> <td>32 x cycle time</td> </tr> <tr> <td>Strong</td> <td>64 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 4 x cycle time | Medium | 32 x cycle time | Strong | 64 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 4 x cycle time | | | | | | | | | | |
| Medium | 32 x cycle time | | | | | | | | | | |
| Strong | 64 x cycle time | | | | | | | | | | |

4.13 2AI I 2/4WIRE High Feature analog electronic module (6ES7134-4MB00-0AB0)

Properties

- 2 inputs for measuring current
- Input ranges:
 - ± 20 mA, resolution 15 bits + sign
 - 4 to 20 mA, resolution 15 bits
- Isolated from the load voltage L+
- Permitted common-mode voltage between the channels 100 VAC
- Supports two-wire or four-wire measuring transducers

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI I 2/4WIRE High Feature (6ES7134-4MB00-0AB0) | | | | |
|---|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | 2-wire transducer: <ul style="list-style-type: none"> • M_{n+}: Input signal "-", channel n • M_{n-}: connect to L- • L+ Input signal "+", channel n • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) 4-wire transducer: <ul style="list-style-type: none"> • M_{n+}: Input signal "+", channel n • M_{n-}: Input signal "-", channel n • L+ Power supply for four-wire measuring transducer • L-: Return circuit for measuring transducer supply • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | L+ | 7 | L+ | |
| 4 | L- | 8 | L- | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

4.13 2AI I 2/4WIRE High Feature analog electronic module (6ES7134-4MB00-0AB0)

Usable terminal modules

| Usable terminal modules for 2AI I 2/4WIRE High Feature (6ES7134-4MB00-0AB0) | | |
|---|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | |

Block diagram

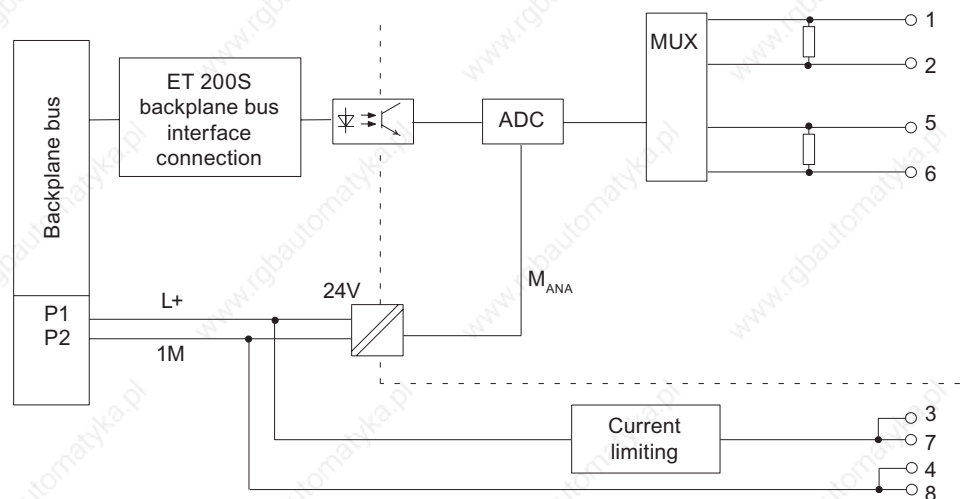


Figure 4-13 Block diagram of the 2AI I 2/4WIRE High Feature

2AI I 2/4WIRE High Feature Technical Specifications (6ES7134-4MB00-0AB0)

| Dimensions and Weight | |
|--|---|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Power supply of the transmitters | Yes |
| • Short-circuit protection | Yes, 60 mA (for both channels) |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels and PE | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between the channels | 140 VDC/100 VAC (with isolated power supply for the measuring transducer) |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 53 mA |
| Power dissipation of the module | Typically 0.85 W |
| Status, interrupts, diagnostics | |
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |

4.13 2AI / 2/4WIRE High Feature analog electronic module (6ES7134-4MB00-0AB0)

| Analog value generation | | | |
|--|---|-----|-----|
| Measuring principle | Integrative | | |
| Integration and cycle time/resolution per channel: | | | |
| • Integration time can be assigned parameters | Yes | | |
| • Interference frequency suppression in Hz | 60 | 50 | no |
| • Integration time in milliseconds | 16.67 | 20 | 7.5 |
| • Conversion time in ms | | | |
| – 1 channel active per module | 25 | 30 | 10 |
| – 2 channels active per module | 58.3 | 70 | 26 |
| • Cycle time in ms | | | |
| – 1 channel active per module | 75 | 90 | 30 |
| – 2 channels active per module | 175 | 210 | 78 |
| • Resolution (including overrange) | ± 20 mA/15 bits + sign 4 mA to 20 mA/15 bits | | |
| Suppression of interference, limits of error | | | |
| Interference voltage suppression for $f = n \times (f_1 \pm 0.5 \%)$, (f_1 = interference frequency) | | | |
| • Common-mode interference (U_{ss}) | min. 100 dB | | |
| • Series-mode interference (peak interference value < rated value of input range) | min. 90 dB | | |
| Crosstalk between the inputs | min. -100 dB | | |
| Operational limit ¹ (over the entire temperature range, with reference to the input range) | ± 0.1 % | | |
| Basic error limit ¹ operational limit at 25 °C with reference to input range | ± 0.05 % | | |
| Temperature error (with reference to the input range) | ± 0.003 %/K | | |
| Linearity error (with reference to the input range) | ± 0.03 % | | |
| Repeatability (in steady state at 25° C with reference to input range) | ± 0.01 % | | |
| Data for selecting a sensor | | | |
| Input range (rated value)/input resistance | | | |
| • Current | ± 20 mA/50 Ω 4 mA to 20 mA/50 Ω | | |
| Permitted input current (destruction limit) | 40 mA (on a single channel) | | |
| Load of the two-wire measuring transducer | max. 750 Ω | | |

4.14 2AI | 4WIRE High Speed analog electronic module (6ES7134-4GB61-0AB0)

| | | |
|---|--|----------------------|
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step | Time constant |
| | None | 1 x cycle time |
| | Weak | 4 x cycle time |
| | Medium | 32 x cycle time |
| | Strong | 64 x cycle time |
| ¹ Run-time calibration can be enabled during module parameter assignment to periodically adjust for the offset voltage drift of the A/D converter. During the calibration interval, the updating of new data is delayed by 200 ms. The accuracy limits of the module will be met without run-time calibration. | | |

4.14 2AI | 4WIRE High Speed analog electronic module (6ES7134-4GB61-0AB0)

Properties

- 2 inputs for measuring current
- Current-limited sensor supply (90 mA)
- Input ranges:
 - 4 to 20 mA, resolution 13 bits
 - 0 to 20 mA, resolution 13 bits
 - ± 20 mA, resolution 13 bits + sign
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 2.5 ms
 - Minimum conversion time of the input modules (T_{WEmin}): 1.1 ms

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

4.14 2AI | 4WIRE High Speed analog electronic module (6ES7134-4GB61-0AB0)

| Terminal assignment for 2AI 4WIRE High Speed (6ES7134-4GB61-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n L+ Power supply for four-wire measuring transducer M_{ana}: Ground (of power module) AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | L+ | 7 | L+ | |
| 4 | M _{ana} | 8 | M _{ana} | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI 4WIRE High Speed (6ES7134-4GB61-0AB0) | | |
|--|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| <p>The diagram shows three terminal modules side-by-side. The first module (left) has terminals 1-4 and AUX1 (A4, A3) with a connection diagram. The second module (middle) has terminals 1-4. The third module (right) has terminals 1-4. To the right is a 'Sample connection' diagram for a 4-wire transducer, showing connections for M+, M-, L+, and M_{ana} to a mA meter.</p> | | |

Block diagram

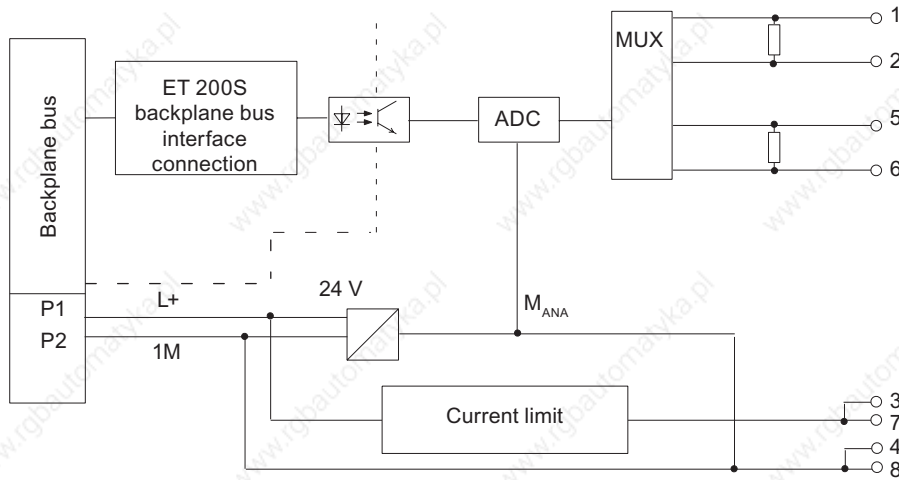


Figure 4-14 Block diagram of the 2AI | 4WIRE High Speed

2AI | 4WIRE High Speed Technical Specifications (6ES7134-4GB61-0AB0)

| Dimensions and Weight | |
|--|---|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 12 bytes (4 bytes when used as 6ES7134 4FB60 0AB0) |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between channels and backplane bus | Yes |
| • Between channels and load voltage L+ | no |
| • Between the channels | no |
| Permissible potential difference | |
| • Between M _{ANA} and M _{internal} (U _{ISO}) | 75 VDC, 60 VAC |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • Power supply and load voltage L+ (no load) | max. 35 mA ¹ |
| Power dissipation of the module | Typically 0.8 W |

4.14 2AI / 4WIRE High Speed analog electronic module (6ES7134-4GB61-0AB0)

| Status, interrupts, diagnostics | |
|---|--|
| Interrupts | |
| • Hardware interrupt | Can be assigned parameters ² |
| Diagnostics function | |
| • Group error display | Red "SF" LED |
| • Diagnostic information readable | Possible ³ |
| Analog value generation | |
| Measuring principle | Instantaneous value encoding |
| Cycle time/resolution: | |
| • Conversion time in ms (per channel) | 0.1 |
| • Cycle time in ms (per module) | 1 |
| • Resolution (including overrange) | 4 mA to 20 mA/13 bit 0 mA to 20 mA/13 bit ± 20 mA/13 bits + sign |
| Suppression of interference, limits of error | |
| Crosstalk between the inputs | > 50 dB |
| Operational limit (in the entire temperature range, with reference to the input range) | ± 0.3 % |
| Basic error limit (operational limit at 25 °C with reference to input range) | ± 0.2 % |
| Temperature error (with reference to the input range) | ± 0.01 %/K |
| Linearity error (with reference to the input range) | ± 0.01 % |
| Repeatability (in steady state at 25° C with reference to input range) | ± 0.05 % |
| Sensor power supply outputs | |
| Number of outputs | 2 |
| Output voltage | |
| • With load | L+ (-2.5 V) |
| Output current | |
| • Rated value | 90 mA (both channels) |
| • Permitted range | 0 mA to 90 mA |
| Short-circuit protection | Yes, electronic |
| Data for selecting a sensor | |
| Input range (rated value)/input resistance | |
| • Current | 4 mA to 20 mA/50 Ω 0 mA to 20 mA/50 Ω ± 20 mA/50 Ω |
| Connection of the sensors | |
| • For current measurement as two-wire transmitter | supported |
| Load of the two-wire measuring transducer | max. 670 Ω |

4.15 2AI RTD Standard analog electronic module (6ES7134-4JB50-0AB0)

| | | |
|--|--|----------------------|
| Maximum input current for current input (destruction limit) | 60 mA | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step | Time constant |
| | None | 1 x cycle time |
| | Weak | 64 x cycle time |
| | Medium | 128 x cycle time |
| | Strong | 512 x cycle time |
| ¹ Without encoder supply voltage ² DPV1 only ³ Parameter assignment error Violation of lower limit value Violation of upper limit value Open circuit (only with 4 mA to 20 mA) Process interrupt lost | | |

4.15 2AI RTD Standard analog electronic module (6ES7134-4JB50-0AB0)

Properties

- 2 inputs for resistance thermometers or resistance measurement
- Input ranges:
 - Resistance thermometers: Pt100, Ni100; resolution 15 bits + sign
 - Resistance measurement: 150 Ω; 300 Ω ; 600 Ω, resolution max. 15 bits + sign
- Isolated from the load voltage L+
- Linearization of the sensor characteristic curves

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

The resistance thermometers/resistors are measured in a four-wire connection. Constant current is fed to the resistance thermometers/resistors by means of connections I_c+ and I_c-. The voltage measured at the resistance thermometer/resistor is measured at the connections M+ and M-. This ensures highly accurate measurement results with the four-wire connection.

With the two/three-wire connection, you must apply corresponding jumpers to the module between M+ and I_c+ or M- and I_c-. However, you have to expect a loss of accuracy in the measurement results.

4.15 2AI RTD Standard analog electronic module (6ES7134-4JB50-0AB0)

| Terminal assignment for 2AI RTD Standard (6ES7134-4JB50-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Measuring line positive, channel n M_{n-}: Measuring line negative, channel n I_{Cn+}: Constant current line positive, channel n I_{Cn-}: Measuring line negative, channel n AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | I _{C0+} | 7 | I _{C1+} | |
| 4 | I _{C0-} | 8 | I _{C1-} | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI RTD Standard (6ES7134-4JB50-0AB0) | | |
|---|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | |

Note

A wire break in the measuring lines of the temperature sensors for three- or four-wire connections (connections 1 and 2, or 5 and 6) is not detected. Undefined values can be reported.

4.15 2AI RTD Standard analog electronic module (6ES7134-4JB50-0AB0)

Block diagram

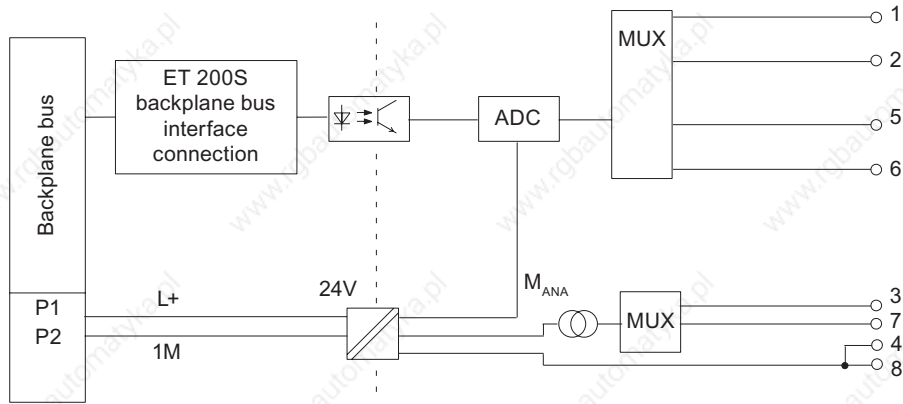


Figure 4-15 Block diagram of the 2AI RTD Standard

2AI RTD Standard Technical Specifications (6ES7134-4JB50-0AB0)

| Dimensions and Weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Power supply of the transmitters | Yes |
| • Constant-current supply for resistance-type sensors | Approx. 1.5 mA |
| • Short-circuit protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between M _{ANA} and the central grounding point (U _{ISO}) | 75 VDC / 60 VAC |

4.15 2AI RTD Standard analog electronic module (6ES7134-4JB50-0AB0)

| | | |
|---|--|-----|
| Insulation tested | 500 VDC | |
| Current consumption | | |
| • From load voltage L+ | max. 30 mA | |
| Power dissipation of the module | Typically 0.6 W | |
| Status, interrupts, diagnostics | | |
| Diagnostics function | | |
| • Group error | Red "SF" LED | |
| • Diagnostic functions readable | Yes | |
| Analog value generation | | |
| Measuring principle | Integrative | |
| Integration and cycle time/resolution per channel: | | |
| • Integration time can be assigned parameters | Yes | |
| • Interference frequency suppression in Hz | 60 | 50 |
| • Integration time in milliseconds | 16.7 | 20 |
| • Conversion time in ms | 110 | 130 |
| • Cycle time in ms | Number of active channels per module x conversion time | |
| • Resolution (including overrange) | Pt100, Ni100/ 15 bits + sign 150 Ω/14 bits/ 300 Ω, 600 Ω/15 bits | |
| Suppression of interference, limits of error | | |
| Interference voltage suppression for $f = n \times (f1 \pm 1 \%)$, ($f1 =$ interference frequency) | | |
| • Common-mode interference (U_{SS}) • Series-mode interference (peak interference value < rated value of input range) | min. 90 dB min. 70 dB | |
| Crosstalk between the inputs | min. -50 dB | |
| Operational limit (in the entire temperature range, with reference to the input range) | $\pm 0.6 \%$ | |
| Basic error limit (operational limit at 25° C with reference to input range) | $\pm 0.4 \%$ | |
| Temperature error (with reference to the input range) | $\pm 0.005 \%/K$ | |
| Linearity error (with reference to the input range) | $\pm 0.01 \%$ | |
| Repeatability (in steady state at 25° C with reference to input range) | $\pm 0.05 \%$ | |

4.16 2AI RTD High Feature analog electronic module (6ES7134-4JB51-0AB0)

| Data for selecting a sensor | | | | | | | | | | | |
|---|--|------|---------------|------|----------------|------|----------------|--------|-----------------|--------|------------------|
| Input range (rated value)/input resistance | | | | | | | | | | | |
| <ul style="list-style-type: none"> • Resistance-type sensor | 150 Ω/min. 2 MΩ 300 Ω/min. 2 MΩ 600 Ω/min. 2 MΩ | | | | | | | | | | |
| <ul style="list-style-type: none"> • Resistance thermometer | Pt100/min. 2 MΩ Ni100/min. 2 MΩ | | | | | | | | | | |
| Permitted input voltage (destruction limit) | max. 9 V | | | | | | | | | | |
| Connection of the sensors | | | | | | | | | | | |
| <ul style="list-style-type: none"> • For measuring resistance <ul style="list-style-type: none"> – Two and three-wire connection – Four-wire connection | Yes, line resistances are also measured, jumpers at T _R Yes | | | | | | | | | | |
| Characteristic curve linearization | Yes, parameters can be assigned for Pt100, Ni100 | | | | | | | | | | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>4 x cycle time</td> </tr> <tr> <td>Medium</td> <td>64 x cycle time</td> </tr> <tr> <td>Strong</td> <td>128 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 4 x cycle time | Medium | 64 x cycle time | Strong | 128 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 4 x cycle time | | | | | | | | | | |
| Medium | 64 x cycle time | | | | | | | | | | |
| Strong | 128 x cycle time | | | | | | | | | | |

4.16 2AI RTD High Feature analog electronic module (6ES7134-4JB51-0AB0)

Characteristics

- 2 inputs for resistance thermometer or resistance measurement
- Input ranges
 - Resistance thermometers: Pt100; Ni100; Ni120; Pt200; Ni200; Pt500; Ni500; Pt1000; Ni1000; Cu10; resolution max. 15 bits + sign
 - Resistance measurement: 150 Ω; 300 Ω; 600 Ω; 3000 Ω; PTC; resolution max. 15 bits
- Automatic compensation of line resistances in the case of a three-wire connection
- Temperature coefficient can be assigned parameters for resistance-type sensors
- High accuracy
- Isolated from the load voltage
- Linearization of the sensor characteristic curves
- Permitted common-mode voltage 5 V_{SS} AC
- Recording of reference junction temperature (together with the 2AI TC Standard electronic module)
- Compatible with the 2AI RTD Standard (6ES7134-4JB50-0AB50)

4.16 2AI RTD High Feature analog electronic module (6ES7134-4JB51-0AB0)

Note

The 2AI RTD High Feature electronic module can replace a 2AI RTD Standard in an existing system.

- The wiring does not have to be changed. The additional bridges on the terminal module of the 2AI RTD Standard do not have to be removed.
- The configuration (in HW Config or the GSD file) does not have to be changed. Only the new functions of the 2AI RTD High Feature cannot be assigned parameters in this instance.

General terminal assignment**Note**

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI RTD High Feature (6ES7134-4NB51-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Measuring line positive, Channel n • M_{n-}: Measuring line negative, Channel n • I_{c0+}: Constant current line positive, Channel n • I_{c0-}: Measuring line negative, Channel n • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | I _{c0+} | 7 | I _{c1+} | |
| 4 | I _{c0-} | 8 | I _{c1-} | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

4.16 2AI RTD High Feature analog electronic module (6ES7134-4JB51-0AB0)

Usable terminal modules

| Usable terminal modules for 2AI RTD High Feature (6ES7134-4NB51-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|-----------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | |

Block diagram

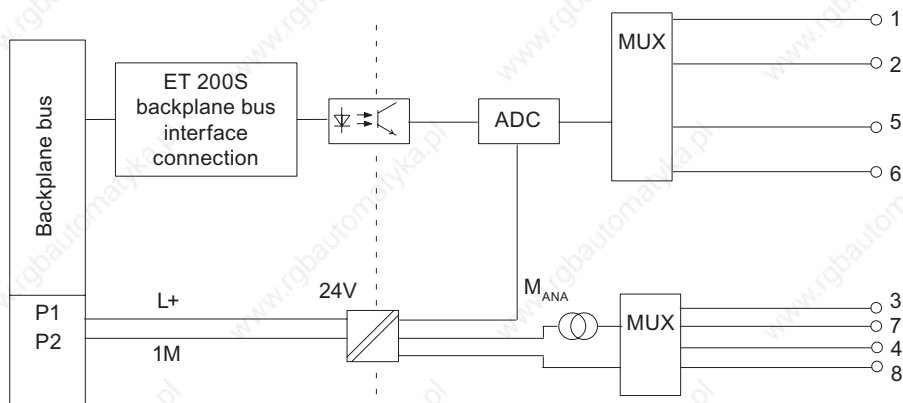


Figure 4-16 Block diagram of the 2AI RTD High Feature

2AI RTD High Feature Technical Specifications (6ES7134-4NB51-0AB0)

| Dimensions and Weight | | |
|--|---|----|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 | |
| Weight | Approx. 40 g | |
| Module-specific data | | |
| Supports isochronous operation | No | |
| Number of inputs | 2 | |
| Cable lengths | | |
| • Shielded | max. 200 m | |
| Parameter length | 7 bytes (4 bytes when used as 2AI RTD Standard) | |
| Voltages, currents, potentials | | |
| Rated load voltage L+ (from the power module) | 24 V DC | |
| • Reverse battery protection | Yes | |
| Power supply of the transmitters | Yes | |
| • Constant-current supply for resistance-type sensors | Approx. 1.25 mA | |
| • Short-circuit protection | Yes | |
| Electrical isolation | | |
| • Between the channels and backplane bus | Yes | |
| • Between the channels and load voltage L+ | Yes | |
| • Between the channels | No | |
| Permitted potential difference | | |
| • Between M _{ANA} and the central grounding point (U _{ISO}) | 75 V DC / 60 V AC | |
| Insulation tested | 500 V DC | |
| Current consumption | | |
| • From load voltage L+ | max. 30 mA | |
| Power dissipation of the module | Typically 0.6 W | |
| Status, alarms, diagnostics | | |
| Diagnostics function | | |
| • General fault | Red LED "SF" | |
| • Diagnostic functions readable | Yes | |
| Analog value generation | | |
| Measuring principle | Integrating (sigma-delta) | |
| Integration and cycle time/resolution per channel: | | |
| • Integration time can be assigned parameters | Yes | |
| • Interference frequency suppression in Hz | 60 | 50 |

4.16 2AI RTD High Feature analog electronic module (6ES7134-4JB51-0AB0)

| | | |
|---|---|----|
| • Integration time in ms | 16.7 | 20 |
| • Basic conversion time incl. integration time in ms | 50 | 60 |
| • Additional conversion time for wire break check diagnosis in ms | 5 | 5 |
| • Additional conversion time in ms for line compensation in three-wire connections | 50 | 60 |
| • Cycle time in ms | Number of active channels per module x conversion time | |
| • Resolution (including overrange) | Pt 100; Ni 100; Ni120; Pt 200; Ni 200; Pt 500; Ni 500; Pt 1000; Ni 1000; Cu 10 / 15 bits + sign 150 Ω; 300 Ω; 600 Ω; 3000 Ω; / 15 bits PTC ¹ / 1 bit | |
| Suppression of interference, limits of error | | |
| Noise suppression for $f = n \times (f_1 \pm 1 \%)$, (f_1 = interference frequency) | | |
| • Common-mode interference (U_{SS}) • Series-mode interference (peak interference value < rated value of input range) | min. 90 dB min. 70 dB | |
| Crosstalk between the inputs | min. -50 dB | |
| Operational limit (in the entire temperature range, with reference to the input range) | | |
| • Resistance-type sensor | $\pm 0,1 \%$ | |
| • Pt100, Pt200, Pt500, Pt1000 Standard | $\pm 1.0 \text{ K}$ | |
| • Pt100, Pt200, Pt500, Pt1000 Climatic | $\pm 0.25 \text{ K}$ | |
| • Ni100, Ni120, Ni200, Ni500, Ni 1000 Standard and Climatic | $\pm 0.4 \text{ K}$ | |
| • Cu10 | $\pm 1.5 \text{ K}$ | |
| Basic error limit for resistance-type sensors (operational limit at 25°C with reference to input range) | | |
| • Resistance-type sensor | $\pm 0.05 \%$ | |
| • Pt100, Pt200, Pt500, Pt1000 Standard | $\pm 0.6 \text{ K}$ | |
| • Pt100, Pt200, Pt500, Pt1000 Climatic | $\pm 0.13 \text{ K}$ | |
| • Ni100, Ni120, Ni200, Ni500, Ni 1000 Standard and Climatic | $\pm 0.2 \text{ K}$ | |
| • Cu10 | $\pm 1.0 \text{ K}$ | |
| Temperature error (with reference to the input range) | $\pm 0.0009\%/K$ | |
| Linearity error (with reference to the input range) | $\pm 0.01 \%$ | |
| Repeat accuracy (in transient state at 25°C, in relation to input range) | $\pm 0.05 \%$ | |

4.16 2AI RTD High Feature analog electronic module (6ES7134-4JB51-0AB0)

| Sensor selection data | | | | | | | | | | | |
|---|---|------|---------------|------|----------------|------|----------------|--------|-----------------|--------|-----------------|
| Input range (rated value)/input resistance | | | | | | | | | | | |
| <ul style="list-style-type: none"> • Resistance-type sensor | 150 Ω /min. 10 M Ω 300 Ω /min. 10 M Ω 600 Ω /min. 10 M Ω 3000 Ω /min. 10 M Ω PTC min 10 M Ω | | | | | | | | | | |
| <ul style="list-style-type: none"> • Resistance thermometer | Pt100/min. 10 M Ω Ni100/min. 10 M Ω Ni120/min. 10 M Ω Pt200/min. 10 M Ω Ni200/min. 10 M Ω Pt500/min. 10 M Ω Ni500/min. 10 M Ω Pt1000/min. 10 M Ω Ni1000/min. 10 M Ω Cu10/min. 10 M Ω | | | | | | | | | | |
| Permitted input voltage (destruction limit) | Max. 9 V | | | | | | | | | | |
| Connection of the sensors <ul style="list-style-type: none"> • For measuring resistance <ul style="list-style-type: none"> – Two-wire connection – Three-wire connection – Four-wire connection | Yes, Yes, internal compensation of line resistances Yes | | | | | | | | | | |
| Characteristic curve linearization | Yes, can be assigned parameters for Ptxxx, Nixxx | | | | | | | | | | |
| Smoothing of the measured values | Yes, parameters can be assigned in 4 steps by means of digital filtering | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>4 x cycle time</td> </tr> <tr> <td>Medium</td> <td>32 x cycle time</td> </tr> <tr> <td>Strong</td> <td>64 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 4 x cycle time | Medium | 32 x cycle time | Strong | 64 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 4 x cycle time | | | | | | | | | | |
| Medium | 32 x cycle time | | | | | | | | | | |
| Strong | 64 x cycle time | | | | | | | | | | |
| ¹ In accordance with VDE 0660 Part 302/303, Type A, no diagnostics for overrun/underrun | | | | | | | | | | | |

Use of Cu10 sensors

- Select "Three-wire thermal resistor" and "Cu10" at parameter assignment.
- Wire the Cu10 sensor in accordance with the three-wire connection method.
- Automatic, internal compensation of line resistance for the missing measuring line occurs during operation.

Note

Please note the following to ensure optimum line compensation in the case of Cu10:

- The sum of the cable resistance and measurement resistance must not exceed 31 Ω.
- The cable must have a resistance of no more than 8 Ω if you want to use the temperature range up to and above 312 °C.
Example: A 200 m Cu cable with a 0.5 mm² conductor cross-section has approximately 7 Ω. A smaller cross-section shortens the permissible cable length accordingly.

Using PTC resistors

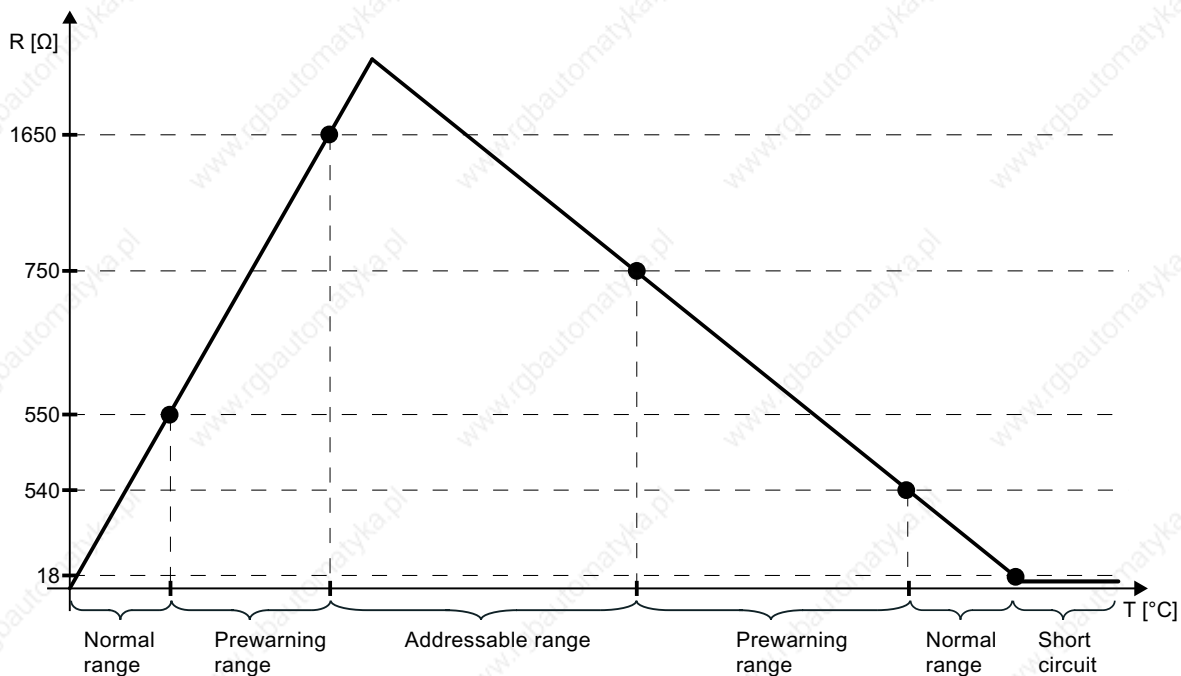
PTCs are suitable for temperature monitoring and as thermal protective devices for complex drives and transformer windings.

- Select "Two-wire resistor" and "PTC" at parameter assignment:
- Connect the PTC in accordance with the two-wire connection method.
- Apply PTC resistors of type A (PTC thermistors) in accordance with DIN / VDE 0660, Part 302.
- If the diagnosis "Overrun/underrun" is enabled, a diagnosis "Lower limit exceeded" indicating a short-circuit is indicated at resistance values < 18 Ω.
- Sensor data for the PTC resistor:

| Characteristic | Technical specifications | Remarks |
|--|---|---|
| Switching points | Behavior with rising temperature | |
| | < 550Ω | Normal range: • SIMATIC S7: Bit 0 = "0", Bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "0", Bit 5 = "0" (in the PII) |
| | 550Ω to 1650Ω | Prewarning range: • SIMATIC S7: Bit 0 = "0", Bit 2 = "1" (in the PII) • SIMATIC S5: Bit 3 = "0", Bit 5 = "1" (in the PII) |
| | > 1650Ω | Addressable range: • SIMATIC S7: Bit 0 = "1", Bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "1", Bit 5 = "0" (in the PII) |
| | Behavior with falling temperature | |
| | > 750Ω | Addressable range: • SIMATIC S7: Bit 0 = "1", Bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "1", Bit 5 = "0" (in the PII) |
| | 750Ω to 540Ω | Prewarning range: • SIMATIC S7: Bit 0 = "0", Bit 2 = "1" (in the PII) • SIMATIC S5: Bit 3 = "0", Bit 5 = "1" (in the PII) |
| | < 540Ω | Normal range: • SIMATIC S7: Bit 0 = "0", Bit 2 = "0" (in the PII) • SIMATIC S5: Bit 3 = "0", Bit 5 = "0" (in the PII) |
| (TNF-5) °C (TNF+5) °C (TNF+15) °C Measuring voltage Voltage on the PTC | max. 550 Ω min. 1330 Ω min. 4000 Ω max. 7.5V | TNF= rated operating temperature |

Example

The diagram below shows the temperature pattern and the switching points belonging to it.



4.17 2AI TC Standard analog electronic module (6ES7134-4JB00-0AB0)

Properties

- 2 inputs for thermocouple or voltage measurement
- Input ranges:
 - Voltage measurement: 80 mV, resolution 15 bits + sign
 - Thermocouples: Type E, N, J, K, L, S, R, B, T, resolution 15 bits + sign
- Isolated from the load voltage L+
- Linearization of the sensor characteristic curves
- Permissible common mode voltage 2 VAC_{SS}

General terminal assignment

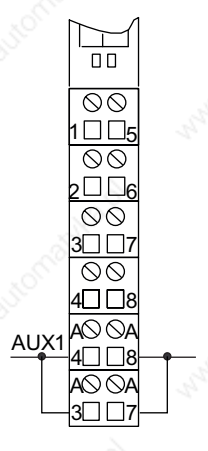
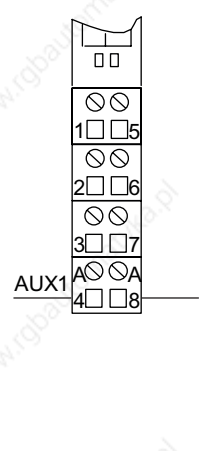
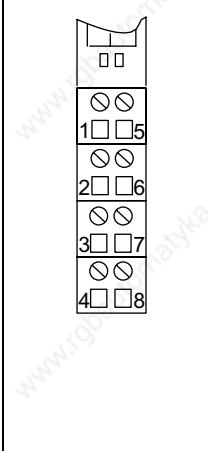
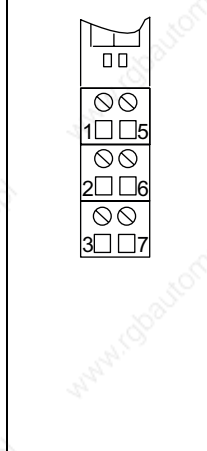
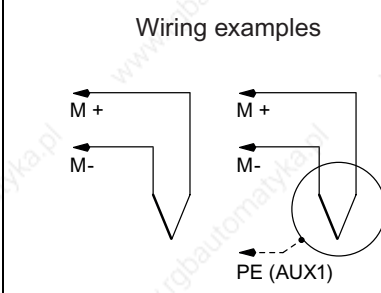
Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI TC Standard (6ES7134-4JB00-0AB0) | | | | |
|--|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Measuring line positive, channel n • M_{n-}: Measuring line negative, channel n • M_{ana}: Ground of the module • n.c.: Not connected (max. DC 30 V can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

4.17 2AI TC Standard analog electronic module (6ES7134-4JB00-0AB0)

Usable terminal modules

| Usable terminal modules for 2AI TC Standard (6ES7134-4JB00-0AB0) | | | | |
|--|--|--|--|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
|  |  |  |  | <p>Wiring examples</p>  <p>Voltage measurement as for 2AI U Standard</p> |

Block diagram

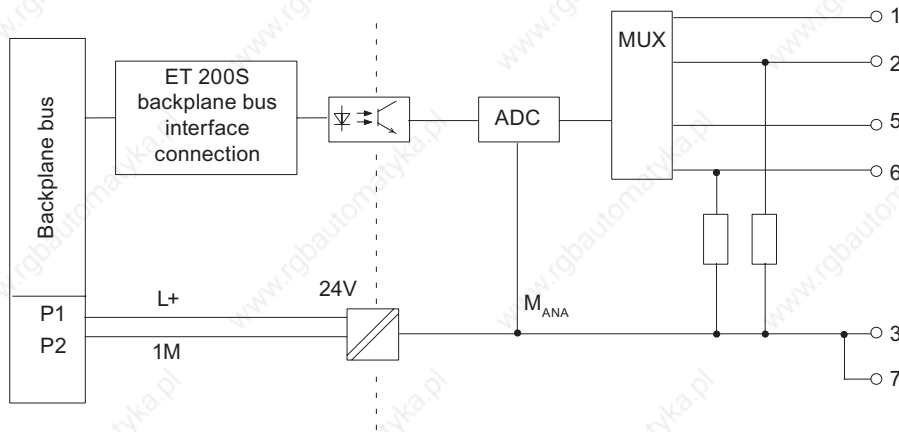


Figure 4-17 Block diagram of the 2AI TC Standard

2AI TC Standard Technical Specifications (6ES7134-4JB00-0AB0)

| Dimensions and Weight | |
|--|---------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 50 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| • Between the channels and 24 V supply voltage | Yes |
| Permissible potential difference | |
| • Between M _{ANA} and the central grounding point (U _{iso}) | 75 VDC / 60 VAC |
| • Between the inputs and M _{ANA} (U _{CM}) | 2 VAC _{SS} |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 30 mA |
| Power dissipation of the module | Typically 0.6 W |
| Status, interrupts, diagnostics | |
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |

4.17 2AI TC Standard analog electronic module (6ES7134-4JB00-0AB0)

| Analog value generation | | |
|---|--|----|
| Measuring principle | Integrative | |
| Integration time/conversion time/resolution per channel: | | |
| <ul style="list-style-type: none"> Integration time can be assigned parameters | Yes | |
| <ul style="list-style-type: none"> Interference frequency suppression in Hz | 60 | 50 |
| <ul style="list-style-type: none"> Integration time in milliseconds | 16.7 | 20 |
| <ul style="list-style-type: none"> Basic conversion time incl. integration time in ms | 55 | 65 |
| <ul style="list-style-type: none"> Additional conversion time for wire break check diagnosis in ms | 20 | 20 |
| <ul style="list-style-type: none"> Cycle time in ms | Number of active channels per module x conversion time | |
| <ul style="list-style-type: none"> Resolution (including overrange) | 15 bits plus sign | |
| Suppression of interference, limits of error | | |
| Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, ($f_1 =$ interference frequency) | | |
| <ul style="list-style-type: none"> Common-mode interference (U_{ss}) Common mode interference (peak value of interference < rated value of input range) | min. 90 dB min. 70 dB | |
| Crosstalk between the inputs | min. -50 dB | |
| Operational limit (over the entire temperature range, with reference to the input range) ¹ | $\pm 0.6 \%$ | |
| Basic error limit (operational limit at 25 °C with reference to input range) ¹ | $\pm 0.4 \%$ | |
| Temperature error (with reference to the input range) | $\pm 0.005 \%/K$ | |
| Linearity error (with reference to the input range) | $\pm 0.01 \%$ | |
| Repeatability (in steady state at 25° C with reference to input range) | $\pm 0.05 \%$ | |

4.17 2AI TC Standard analog electronic module (6ES7134-4JB00-0AB0)

| Data for selecting a sensor | | | | | | | | | | | |
|---|---|------|---------------|------|----------------|------|----------------|--------|-----------------|--------|-----------------|
| Input range (rated value)/input resistance | | | | | | | | | | | |
| • Voltage | ± 80 mV/min. $1\text{ M}\Omega$ | | | | | | | | | | |
| • Thermocouple | Type E, N, J, K, L, S, R, B, T/min. $1\text{ M}\Omega$ | | | | | | | | | | |
| Permitted input voltage (destruction limit) | ± 10 V, continuous | | | | | | | | | | |
| Connection of the sensors | | | | | | | | | | | |
| • For measuring voltage | supported | | | | | | | | | | |
| Characteristic curve linearization | Yes, can be assigned parameters for type E, N, J, K, L, S, R, B, T as per IEC 584 | | | | | | | | | | |
| Temperature compensation | | | | | | | | | | | |
| • Internal temperature compensation | not supported | | | | | | | | | | |
| • External temperature compensation by looping a compensating box into the measuring circuit | Possible, one external compensating box per channel | | | | | | | | | | |
| • External compensation by means of temperature value obtained at an analog module of the same ET 200S station | Yes | | | | | | | | | | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>4 x cycle time</td> </tr> <tr> <td>Medium</td> <td>32 x cycle time</td> </tr> <tr> <td>Strong</td> <td>64 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 4 x cycle time | Medium | 32 x cycle time | Strong | 64 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 4 x cycle time | | | | | | | | | | |
| Medium | 32 x cycle time | | | | | | | | | | |
| Strong | 64 x cycle time | | | | | | | | | | |
| ¹ for Type N: from $-150\text{ }^{\circ}\text{C}$, type B: from $200\text{ }^{\circ}\text{C}$, type T: from $-230\text{ }^{\circ}\text{C}$ | | | | | | | | | | | |

Compensation of thermocouples with a compensating box

As well as the error limits of the 2AI TC Standard electronic module (see Table "Technical specifications 2AI TC Standard (6ES7134-4JB00-0AB0)" in this chapter) you must also take the accuracy of the compensating box into account.

Compensation of thermocouples with a Pt100 on the 2AI RTD Standard

| Factors affecting the accuracy of the temperature measurement | |
|---|--|
| Wiring rules | Ensure there is good thermal contact between the reference junction and the Pt100 used for compensation. |
| | We recommend that you wire the Pt100 with a four-wire connection. |
| Additional technical specifications on the error limits of the 2AI TC | The accuracy of the thermal resistor (Pt100) used for compensation must be taken into account. ¹ |
| | The error of the measurement input (2AI RTD Standard) used for compensation must be taken into account. ¹ |
| <p>¹ In the case of thermocouples with a characteristic curve with a very shallow gradient, these errors can lead to a major measurement discrepancy. For the following thermocouples, this causes a limitation of the input range of the thermocouples in which the accuracy information in the manual applies:</p> <ul style="list-style-type: none"> • Type N: -100 °C • Type K: -230 °C • Type E: -230 °C | |

See also

2AI U Standard analog electronic module (6ES7134-4FB01-0AB0) (Page 4-38)

4.18 2AI RTD High Feature analog electronic module (6ES7134-4NB01-0AB0)

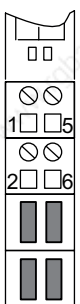
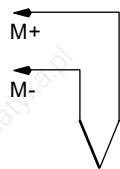
Properties

- 2 inputs for thermocouple or voltage measurement
- Input ranges:
 - Voltage measurement: ± 80 mV, resolution 15 bits + sign
 - Thermocouples: Types E, N, J, K, L, S, R, B, T, C, resolution 15 bits + sign
- Isolated from the load voltage L+
- Linearization of the sensor characteristic curves
- Permitted common-mode voltage 140 VDC/100 VAC
- Internal reference junction in connection with TM-E15S24-AT or TM-E15C24-AT

General terminal assignment

| Terminal assignment for 2AI TC High Feature (6ES7134-4NB01-0AB0) | | | | |
|--|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Measuring line positive, channel n • M_{n-}: Measuring line negative, channel n |
| 2 | M ₀₋ | 6 | M ₁₋ | |

Usable terminal modules

| Usable terminal modules for 2AI TC High Feature (6ES7134-4NB01-0AB0) | |
|---|--|
| TM-E15C24-AT (6ES7193-4CL30-0AA0) | ← Spring terminal |
| TM-E15S24-AT (6ES7193-4CL20-0AA0) | ← Screw terminal |
|  | Sample connection  |

Block diagram

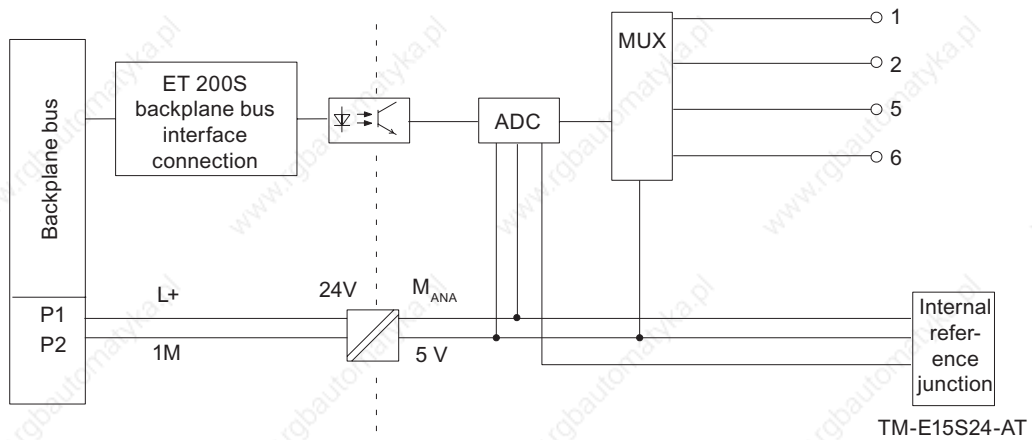


Figure 4-18 Block diagram of the 2AI TC High Feature

2AI TC High Feature Technical Specifications (6ES7134-4NB01-0AB0)

| Dimensions and Weight | |
|--|-------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | max. 50 m |
| Parameter length | 4 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| • Between the channels and 24 V supply voltage | Yes |
| Permissible potential difference | |
| • Between M _{ANA} and the central grounding point (U _{iso}) | 75 VDC / 60 VAC |
| • Between the inputs and M _{ANA} (U _{CM}) | 140 VDC / 100 VAC |

4.18 2AI RTD High Feature analog electronic module (6ES7134-4NB01-0AB0)

| | | |
|---|--|----|
| Insulation tested | 500 VDC | |
| Current consumption | | |
| • From load voltage L+ | max. 30 mA | |
| Power dissipation of the module | Typically 0.6 W | |
| Status, interrupts, diagnostics | | |
| Diagnostics function | | |
| • Group error | Red "SF" LED | |
| • Diagnostic functions readable | Yes | |
| Analog value generation | | |
| Measuring principle | Integrative | |
| Integration time/conversion time/resolution per channel: | | |
| • Integration time can be assigned parameters | Yes | |
| • Interference frequency suppression in Hz | 60 | 50 |
| • Integration time in milliseconds | 16.7 | 20 |
| • Basic conversion time incl. integration time in ms | 66 | 80 |
| • Additional conversion time for wire break check diagnosis in ms | 5 | 5 |
| • Cycle time in ms | Number of active channels per module x conversion time | |
| • Resolution (including overrange) | 15 bits + sign | |
| Suppression of interference, limits of error | | |
| Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, ($f_1 =$ interference frequency) | | |
| • Common-mode interference (U_{SS}) • Series-mode interference (peak interference value < rated value of input range) | min. 90 dB min. 70 dB | |
| Crosstalk between the inputs | min. -50 dB | |
| Operational limit for ± 80 mV (over the entire temperature range with reference to the input range) | $\pm 0.1 \%$ | |
| Operational limit for thermocouples (over the entire temperature range with reference to the input range) ¹ | ± 1.5 K | |
| Operational limit for thermocouple type C (in the entire temperature range with reference to the input range) ¹ | ± 7 K | |
| Basic error limit for ± 80 mV (operational limit at 25 °C with reference to the input range) | $\pm 0.05 \%$ | |
| Basic error limit for thermocouples (operational limit at 25 °C with reference to input range) ¹ | ± 1 K | |

4.18 2AI RTD High Feature analog electronic module (6ES7134-4NB01-0AB0)

| | |
|---|-------------|
| Basic error limit for thermocouples of type C (operational limit at 25 °C with reference to the input range) ¹ | ± 5 K |
| Temperature error (with reference to the input range) | ± 0.005 %/K |
| Linearity error (with reference to the input range) | ± 0.01 % |
| Repeatability (in steady state at 25 °C with reference to input range) | ± 0.05 % |
| Overall error limits using internal compensation | |
| <ul style="list-style-type: none"> Operational limit (in the entire temperature range with a static, thermal state, ambient temperature change < 0.3 K/min)² | ± 2.5 K |
| <ul style="list-style-type: none"> Basic error limit (operational limit at 25 °C with a static, thermal state, ambient temperature change < 0.3 K/min)³ | ± 1.5 K |

4.18 2AI RTD High Feature analog electronic module (6ES7134-4NB01-0AB0)

| Data for selecting a sensor | | |
|--|--|----------------------|
| Input range (rated value)/input resistance | | |
| • Voltage | $\pm 80\text{m V/min. } 1\text{ M}\Omega$ | |
| • Thermocouple | Type E, N, J, K, L, S, R, B, T, C/min. $1\text{ M}\Omega$ | |
| Permitted input voltage (destruction limit) | $\pm 20\text{ V}$, continuous | |
| Connection of the sensors | | |
| • For measuring voltage | supported | |
| Characteristic curve linearization | Yes, can be assigned parameters for type E, N, J, K, L, S, R, B, T, C as per IEC 584 | |
| Temperature compensation | | |
| • Internal temperature compensation | Possible with TM-E15S24-ATTM-E15C24-AT | |
| • External temperature compensation by looping a compensating box into the measuring circuit | Possible, one external compensating box per channel | |
| Smoothing of the measured values | Yes, can be assigned parameters in 4 steps by means of digital filtering | |
| | Step | Time constant |
| | None | 1 x cycle time |
| | Weak | 4 x cycle time |
| | Medium | 32 x cycle time |
| | Strong | 64 x cycle time |
| ¹ The specified error limits apply starting with the following temperatures: <ul style="list-style-type: none"> • Thermocouple Type T: $-200\text{ }^{\circ}\text{C}$ • Thermocouple type K: $-100\text{ }^{\circ}\text{C}$ • Thermocouple Type B: $+700\text{ }^{\circ}\text{C}$ • Thermocouple type N: $-150\text{ }^{\circ}\text{C}$ • Thermocouple type E: $-150\text{ }^{\circ}\text{C}$ • Thermocouple Type R: $+200\text{ }^{\circ}\text{C}$ • Thermocouple Type S: $+100\text{ }^{\circ}\text{C}$ | | |
| ² In the case of thermocouple type C: $\pm 8\text{ K}$ | | |
| ³ In the case of thermocouple type C: $\pm 6\text{ K}$ | | |

Compensation of thermocouples with a compensating box

As well as the error limits of the 2AI TC High Feature electronic module (see Table "Technical specifications 2AI TC High Feature (6ES7134-4NB01-0AB0)" in this chapter) you must also take the accuracy of the compensating box into account.

Internal compensation with TM-E 15S24-AT or TM-E15C24-AT

| Factors affecting the accuracy of the temperature measurement | |
|--|---|
| Rules on using internal temperature compensation | The connected channel with internal compensation must be assigned parameters separately. |
| | Don't insert the 2AI TC High Feature directly next to a power module with high incoming current (> 3 A). An incoming current of 10 A can result in a further ± 2 K error. |
| Additional technical specifications for the error limits of the 2AI TC High Feature | The station must be in a static state ¹ to ensure that the specified accuracy is achieved. |
| | Accuracy is achieved 30 minutes after the static state has been achieved. |
| | The overall malfunction of the channel is caused by the combination of the input error and the internal compensation error. |
| ¹ The static state is defined by an almost constant ambient temperature (no draft, for example, in a closed cabinet!) | |

See also

2AI U Standard analog electronic module (6ES7134-4FB01-0AB0) (Page 4-38)

4.19 2AO U Standard analog electronic module (6ES7135-4FB01-0AB0)

Properties

- 2 outputs for voltage output
- Output range:
 - ± 10 V, resolution 13 bits + sign
 - 1 to 5 V, resolution 12 bits
- Isolated from the load voltage L+

General terminal assignment




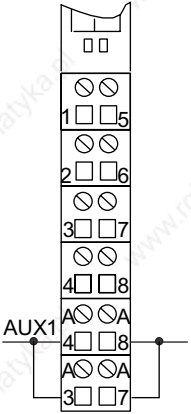
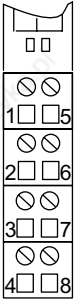
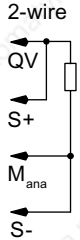
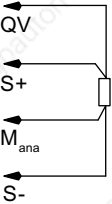
Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

4.19 2AO U Standard analog electronic module (6ES7135-4FB01-0AB0)

| Terminal assignment for 2AO U Standard (6ES7135-4FB01-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | QV ₀ | 5 | QV ₁ | <ul style="list-style-type: none"> QV_n: Analog output voltage, channel n S_{n+}: Tracer line positive, channel n S_{n-}: Tracer line negative, channel n M_{ana}: Ground of the module AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | S ₀₊ | 6 | S ₁₊ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | S ₀₋ | 8 | S ₁₋ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AO U Standard (6ES7135-4FB01-0AB0) | | |
|---|---|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) |  Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) |  Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) |  Fast Connect |
|  |  | <p>Wiring examples</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>2-wire</p>  </div> <div style="text-align: center;"> <p>4-wire</p>  </div> </div> |

4.19 2AO U Standard analog electronic module (6ES7135-4FB01-0AB0)

Block diagram

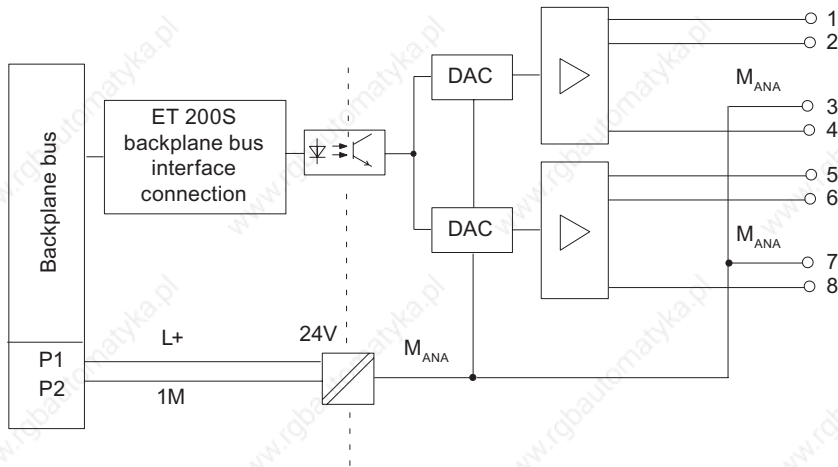


Figure 4-19 Block diagram of the 2AO U Standard

2AO U Standard Technical Specifications (6ES7135-4FB01-0AB0)

| Dimensions and Weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 7 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between MANA and the central grounding point (U_{iso}) | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 130 mA |
| Power dissipation of the module | max. 2 W |

4.19 2AO U Standard analog electronic module (6ES7135-4FB01-0AB0)

| Status, interrupts, diagnostics | |
|---|---|
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |
| Analog value generation | |
| Resolution (including overrange) | ± 10 V/13 bits + sign 1 to 5 V/12 bits |
| Cycle time | max. 1.5 ms |
| Settling time | |
| • For resistive load | 0.1 ms |
| • For capacitive load | 0.5 ms |
| • For inductive load | 0.5 ms |
| Substitute value can be assigned parameters | Yes |
| Suppression of interference, limits of error | |
| Crosstalk between the outputs | min. -40 dB |
| Operational limit (in the entire temperature range, with reference to the output range) | ± 0.4 % |
| Basic error limit (operational limit at 25 °C with reference to output range) | ± 0.2 % |
| Temperature error (with reference to the output range) | ± 0.01 %/K |
| Linearity error (with reference to the output range) | ± 0.02 % |
| Repeatability (in steady state at 25 °C with reference to output range) | ± 0.05 % |
| Output ripple (with reference to output range, bandwidth 0 to 50 kHz) | ± 0.02 % |
| Data for selecting an actuator | |
| Output range (rated value) | ± 10 V 1 V to 5 V |
| Load resistance | min. 1.0 k Ω |
| • For capacitive load | max. 1 μ F |
| • Short-circuit protection | Yes |
| • Short-circuit voltage | Approx. 25 mA |
| Destruction limit against voltages/currents applied from outside | |
| • Voltage at the outputs to M _{ANA} | 15 V continuous; 75 V for max. 1 ms (sampling ratio 1:20) |
| • Current | max. 50 mA DC |
| Connection of actuators | |
| • Two-wire connection | Possible, without compensation of cable resistance |
| • Four-wire connection | Yes |

4.20 2AO U High Feature analog electronic module (6ES7135-4LB01-0AB0)

Properties

- 2 outputs for voltage output
- Output range:
 - ± 10 V, resolution 15 bits + sign
 - 1 to 5 V, resolution 14 bits
- Isolated from the load voltage L+
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 3.75 ms
 - Minimum conversion time of the output modules: (T_{WAmin}): 1.5 ms

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AO U High Feature (6ES7135-4LB02-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | QV ₀ | 5 | QV ₁ | <ul style="list-style-type: none"> • QV_n: Analog output voltage, channel n • S_{n+}: tracer line positive, channel n • S_{n-}: tracer line negative, channel n • M_{ana}: Ground of the module • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | S ₀₊ | 6 | S ₁₊ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | S ₀₋ | 8 | S ₁₋ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

4.20 2AO U High Feature analog electronic module (6ES7135-4LB01-0AB0)

Usable terminal modules

| Usable terminal modules for 2AO U High Feature (6ES7135-4LB02-0AB0) | | |
|---|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | |

Block diagram

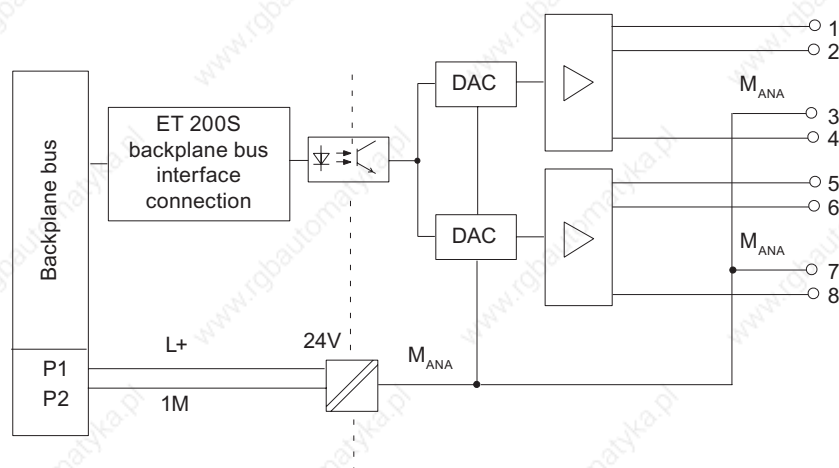


Figure 4-20 Block diagram of the 2AO U High Feature

2AO U High Feature Technical Specifications (6ES7135-4LB02-0AB0)

| Dimensions and Weight | |
|--|--|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of outputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 7 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse battery protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage L+ | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between MANA and the central grounding point (U_{iso}) | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | max. 130 mA |
| Power dissipation of the module | max. 2 W |
| Status, interrupts, diagnostics | |
| Diagnostics function | |
| • Group error display | Red "SF" LED |
| • Diagnostic information readable | supported |
| Substitute values can be applied | Yes, parameterizable |
| Analog value generation | |
| Resolution (including sign) | ± 10 V/16 bits 1 V to 5 V/14 bits |
| Conversion time (per channel) | max. 1.0 ms |
| Settling time | |
| • For resistive load | 0.1 ms |
| • For capacitive load | 0.5 ms |
| • For inductive load | 0.5 ms |

4.20 2AO U High Feature analog electronic module (6ES7135-4LB01-0AB0)

| Suppression of interference, limits of error | |
|--|--|
| Crosstalk between the outputs | > 60 dB |
| Operational limit (in the entire temperature range, with reference to the output range) | $\pm 0.07\%$ |
| Basic error limit (operational limit at 25 °C with reference to output range) | $\pm 0.03\%$ |
| Temperature error (with reference to the output range) | $\pm 0.001\%/K$ |
| Linearity error (with reference to the output range) | $\pm 0.02\%$ |
| Repeatability (in steady state at 25 °C with reference to output range) | $\pm 0.01\%$ |
| Output ripple; range 0 Hz to 50 kHz (relative to output range) | $\pm 0.02\%$ |
| Data for selecting an actuator | |
| Output range (rated value) | $\pm 10\text{ V}$ 1 V to 5 V |
| Load impedance (in the rated range of the output) • At voltage outputs Capacitive load | Min. 1.0 k Ω max. 1 μF |
| Voltage output • Short-circuit protection • Short-circuit voltage | yes approx. 25 mA |
| Destruction limit against voltages/currents applied from outside | |
| • Voltage at the outputs to M _{ANA} | Max. 15 V continuous; 75 V for max. 1 ms (sampling ratio 1:20) |
| • Current | max. 50 mA DC |
| Connection of actuators • Voltage output 2-wire connection 4-wire connection | Possible, without compensation of the line resistances Possible |

4.21 2AO I Standard analog electronic module (6ES7135-4GB01-0AB0)

Properties

- 2 outputs for current output
- Output range:
 - ± 20 mA, resolution 13 bits + sign
 - 4 to 20 mA, resolution 13 bits
- Isolated from the load voltage L+

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AO I Standard (6ES7135-4GB01-0AB0) | | | | |
|---|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | QI ₀ | 5 | QI ₁ | <ul style="list-style-type: none"> • QI_n: Current analog output, channel n • M_{ana}: Ground of the module • n.c.: Not connected (max. DC 30 V can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | n.c. | 6 | n.c. | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

4.21 2AO I Standard analog electronic module (6ES7135-4GB01-0AB0)

Usable terminal modules

| Usable terminal modules for 2AO I Standard (6ES7135-4GB01-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|-------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | |

Block diagram

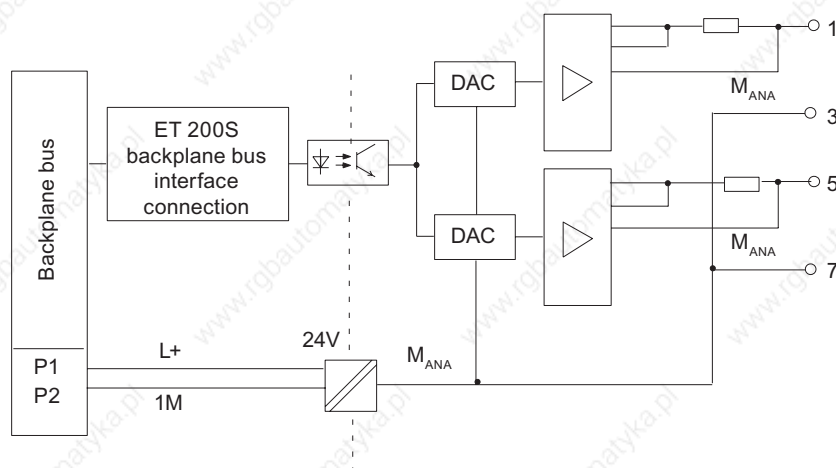


Figure 4-21 Block diagram of the 2AO I Standard

2AO I Standard Technical Specifications (6ES7135-4GB01-0AB0)

| Dimensions and Weight | |
|--|---|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of outputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 7 bytes |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the channels and load voltage | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between MANA and the central grounding point (U_{iso}) | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the power supply L+ | max. 150 mA |
| Power dissipation of the module | max. 2 W |
| Status, interrupts, diagnostics | |
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic functions readable | Yes |
| Analog value generation | |
| Resolution (including overrange) | ± 20 mA/13 bits + sign 4 mA to 20 mA/13 bits |
| Cycle time | max. 1.5 ms |
| Settling time | |
| • For resistive load | 0.1 ms |
| • For capacitive load | 0.5 ms |
| • For inductive load | 0.5 ms |
| Substitute values can be applied | Yes |

4.21 2AO I Standard analog electronic module (6ES7135-4GB01-0AB0)

| Suppression of interference, limits of error | |
|--|--|
| Crosstalk between the outputs | min. -40 dB |
| Operational limit (in the entire temperature range, with reference to the output range) | $\pm 0.5 \%$ |
| Basic error limit (operational limit at 25 °C with reference to output range) | $\pm 0.3 \%$ |
| Temperature error (with reference to the output range) | $\pm 0.01 \%/K$ |
| Linearity error (with reference to the output range) | $\pm 0.02 \%$ |
| Repeatability (in steady state at 25 °C with reference to output range) | $\pm 0.05 \%$ |
| Output ripple (with reference to output range, bandwidth 0 to 50 kHz) | $\pm 0.02 \%$ |
| Data for selecting an actuator | |
| Output range (rated value) | $\pm 20 \text{ mA}$ 4 to 20 mA |
| Load resistance | max. 500 Ω |
| <ul style="list-style-type: none"> • For inductive load • Open circuit voltage | 1 mH 18 V |
| Destruction limit against voltages/currents applied from outside | |
| <ul style="list-style-type: none"> • Voltage at the outputs to M_{ANA} • Current | 15 V continuous; 75 V for max. 1 ms (sampling ratio 1:20) max. 50 mA DC |
| Connection of actuators | |
| <ul style="list-style-type: none"> • Two-wire connection • Four-wire connection | Yes no |

4.22 2AO I High Feature analog electronic module (6ES7135-4MB01-0AB0)

Properties

- 2 outputs for current output
- Output range:
 - ± 20 mA, resolution 15 bits + sign
 - 4 to 20 mA, resolution 15 bits
- Isolated from the load voltage L+
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 3.75 ms
 - Minimum conversion time of the output modules: (T_{WAmin}): 1.5 ms

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AO I High Feature (6ES7135-4MB02-0AB0) | | | | |
|---|------------------|----------|------------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | QI ₀ | 5 | QI ₁ | <ul style="list-style-type: none"> • QI_n: Current analog output, channel n • M_{ana}: Ground of the module • n.c.: Not connected (max. DC 30 V can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | n.c. | 6 | n.c. | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AO I High Feature (6ES7135-4MB02-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Sample connection</p> |

Block diagram

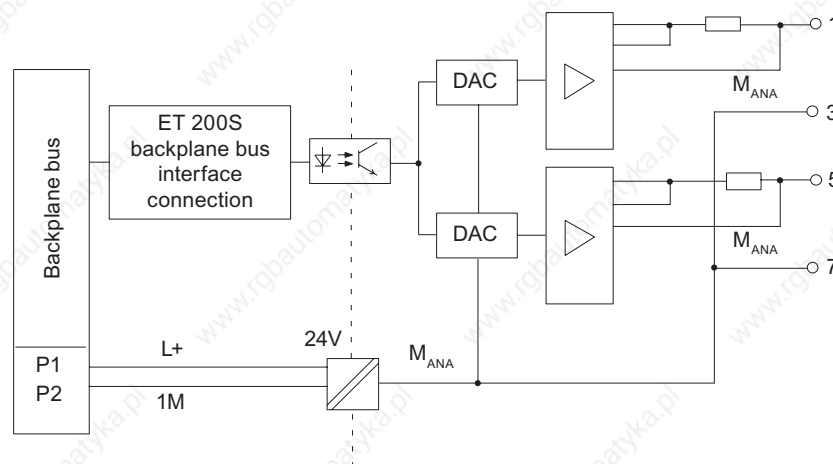


Figure 4-22 Block diagram of the 2AO I High Feature

2AO I High Feature Technical Specifications (6ES7135-4MB02-0AB0)

| Dimensions and Weight | |
|--|---|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |
| Data for specific modules | |
| Supports isochronous operation | Yes |
| Number of outputs | 2 |
| Cable length | |
| • Shielded | max. 200 m |
| Parameter length | 7 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage of the electronics L+ | 24 VDC |
| • Reverse battery protection | Yes |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between channels and power supply of the electronics | Yes |
| • Between the channels | no |
| Permissible potential difference | |
| • Between MANA and M _{internal} (U _{ISO}) | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the power supply L+ | max. 150 mA |
| Power dissipation of the module | max. 2 W |
| Status, interrupts, diagnostics | |
| Diagnostics function | |
| • Group error display | Red "SF" LED |
| • Diagnostic information readable | Yes |
| Substitute values can be applied | Yes, parameterizable |
| Analog value generation | |
| Resolution (including sign) | ± 20 mA/16 bits 4 to 20 mA/15 bits |
| Conversion time (per channel) | max. 1.0 ms |
| Settling time | |
| • For resistive load | 0.25 ms |
| • For capacitive load | 1.0 ms |
| • For inductive load | 0.5 ms |
| Suppression of interference, limits of error | |
| Crosstalk between the outputs | > 60 dB |
| Operational limit (in the entire temperature range, with reference to the output range) | ±0.07 % (at 250 Ω load impedance) ±0.3 % (for all other load impedances) |

4.22 2AO I High Feature analog electronic module (6ES7135-4MB01-0AB0)

| | |
|---|--|
| Basic error limit (operational limit at 25 °C with reference to output range) | ±0.03 % (at 250 Ω load impedance) ±0.26 % (for all other load impedances) |
| Temperature error (with reference to the output range) | ± 0.001 %/K |
| Linearity error (with reference to the output range) | ± 0,02 % |
| Repeatability (in steady state at 25 °C with reference to output range) | ± 0,01 % |
| Output ripple (with reference to output range, bandwidth 0 to 50 kHz) | ± 0,02 % |
| Data for selecting an actuator | |
| Output range (rated value) | ± 20 mA 4 to 20 mA |
| Load impedance (in the rated range of the output) | |
| <ul style="list-style-type: none"> • For current outputs <li style="padding-left: 20px;">For inductive load | Max. 500 Ω 1 mH |
| Current output | |
| <ul style="list-style-type: none"> • Open circuit voltage | 18 V |
| Destruction limit against voltages/currents applied from outside | |
| <ul style="list-style-type: none"> • Voltage at the outputs to M_{ANA} | 15 V continuous; 75 V for max. 1 ms (sampling ratio 1:20) |
| <ul style="list-style-type: none"> • Current | max. 50 mA DC |
| Connection of actuators | |
| <ul style="list-style-type: none"> • Current output <li style="padding-left: 20px;">Two-wire connection | supported |

4 IQ-SENSE (6ES7138-4GA00-0AB0)

5.1 Features of 4 IQ-SENSE

Characteristics

The 4 IQ-SENSE has the following characteristics:

- Connection of sensors with IQ-SENSE®, photoelectric proximity switches: for example, retro-reflective sensors, diffuse sensors, and laser sensors.
- You can connect up to 4 sensors to every module. Each sensor requires a two-wire cable.
- Excess gain and monitoring
- Time functions, switching hysteresis, synchronization groups that can be assigned parameters
- Sensitivity and distance values can be specified (*IntelliTeach* using the "IQ-SENSE Opto" FB)
- Teach-in
- Module can be removed and inserted during operation (restart the *Teach-in* using the "IQ-SENSE Opto" function block or the button on the sensor)
- Sensors can be removed and inserted during operation (automatic reassignment of parameters)
- Supports sensors with alignment tool
- The 4 IQ-SENSE is a single-width (15 mm) electronic module that can be used with the following terminal modules:
 - TM-E15S24-01, TM-E15C24-01 and TM-E15N24-01
 - TM-E15S26-A1, TM-E15C26-A1 and TM-E15N26-A1

Parameter assignment

You set the parameters for the 4 IQ-SENSE using the *STEP 7* parameter assignment software.

| Configuration rules | |
|---|--|
| STEP 7 as of V5.1 SP3 | With STEP 7 as of V5.0, Service Pack 3 or other configuration software |
| Contained in the hardware catalog of HW Config. A GSD file is not required. | IM151-1 BASIC: GSD file SIEM80F3.GSx as of 09/02 (as of V1.0) |
| | IM151-1 STANDARD: GSD file SIEM806A.GSx as of 10/01 (as of V1.10) |
| | IM151-1 FO STANDARD GSD file SIEM806B.GSx as of 10/01 (as of V1.5) |
| | IM151-1 HIGH FEATURE GSD file SIR380E0.GSx as of 12/01 (as of V1.0) |
| | IM151-3 PN (6ES7151-3AA10-0AB0) IM151-3 PN HIGH FEATURE |

5.2 Parameters for the 4 IQ-SENSE

5.2.1 Parameters

Table 5-1 Parameters for the 4 IQ-SENSE

| Parameters | Value range | Default setting | Applicability |
|-----------------------|---|-------------------------|---------------|
| Group diagnostics | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Synchronization group | <ul style="list-style-type: none"> • 1 • 2 • 3 • 4 | 1 | Module |
| Sensor type | <ul style="list-style-type: none"> • Retro-reflective sensor • Diffuse sensor • De-activated | Retro-reflective sensor | Channel |
| Switching hysteresis | <ul style="list-style-type: none"> • 5 % • 10 % • 20 % • 50 % | 20 % | Channel |

| Parameters | Value range | Default setting | Applicability |
|------------------|--|--------------------------------------|---------------|
| Time functions | <ul style="list-style-type: none"> • None • Return delay • Pickup delay • Pickup and return delay • Momentary impulse | None | Channel |
| Time value | <ul style="list-style-type: none"> • 5 ms • 10 ms • 20 ms • 50 ms • 100 ms • 200 ms • 500 ms • 1 s • 2 s • 5 s • 10 s | 5 ms | Channel |
| Teach-in disable | <ul style="list-style-type: none"> • <i>Teach-in</i> with button possible • <i>Teach-in</i> with button not possible | <i>Teach-in</i> with button possible | Channel |

Note

Unused channels of the module must be deactivated otherwise the wire break diagnosis will be reported.

Measurement type parameter: **De-activated**

- All the diagnostics are suppressed.
- Sensitivity/distance values and circuit states are set to "0".
- The sensor is switched off.

5.2.2 Group diagnostics parameter

If group diagnostics is enabled, a pending diagnostics message is entered.

Reference

Information on channel-related diagnostics can be found in the *ET 200S Operating Instructions*.

5.2.3 Synchronization group parameter

- Sensors between different modules of the 4 IQ-SENSE may influence one another (e.g. scattered light).
- To prevent interference from neighboring sensors on different modules, this parameter can be used to allocate a separate synchronization group to every module. Modules in different synchronization groups do not interfere with one another.
- Sensors on the same module cannot interfere with one another.

Operating principle

The diagram below explains the functioning of the synchronization group parameter:

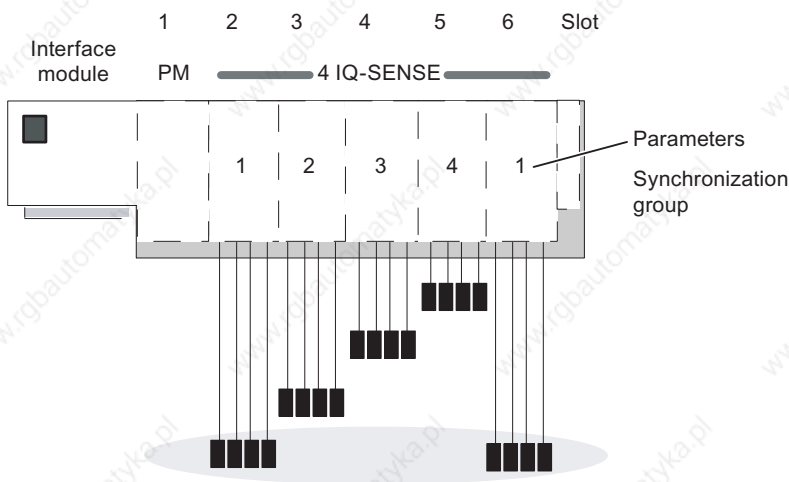


Figure 5-1 Synchronization group

Mutual interference is only possible between the sensors of the modules in slot 2 and 6, because they are in the same synchronization group 1.

Note

Sensors in the same synchronization group must be installed to maintain the minimum clearance (see sensor package insert) and to prevent mutual interference.


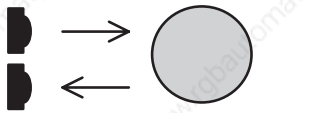
5.2.4 Sensor type parameter

This parameter is used to set the sensor type per channel:

- Retro-reflective sensor or
- Diffuse sensor or
- De-activated

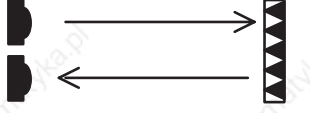
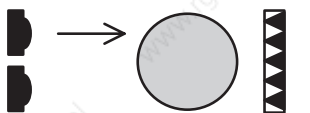
Diffuse sensor

Table 5-2 Diffuse sensor

| Diffuse sensor | Object | |
|-------------------------|---|---|
| Transmitter Receiver |  | Circuit state 0: no object detected, i.e. the object is not in the beam. The receiver does not detect light |
| Transmitter Receiver |  | Circuit state 1: object detected, i.e. the object is in the beam. The receiver does not detect light |

Retro-reflective sensor

Table 5-3 Retro-reflective sensor

| Retro-reflective sensor | Object | |
|-------------------------|--|--|
| Transmitter Receiver |  | Circuit state 0: no object detected, i.e. the object is not in the beam. The receiver detects light. |
| Transmitter Receiver |  | Circuit state 1: object detected, i.e. the object is in the beam. The receiver does not detect light |

5.2.5 Switching hysteresis parameter

Faults with the diffuse sensor or in the production process can result in signal wobbles. The measured value then changes the switching threshold by 100 % (object detected - object not detected). You can prevent this switching threshold wobble using the switching hysteresis parameter. This will ensure a stable output signal on the sensor.

You can assigned parameters to 5 %/10 %/20 %/50 % for switching hysteresis.

Prerequisites

You can only set the switching hysteresis parameter for diffuse sensors with background fadeout.

Operating principle

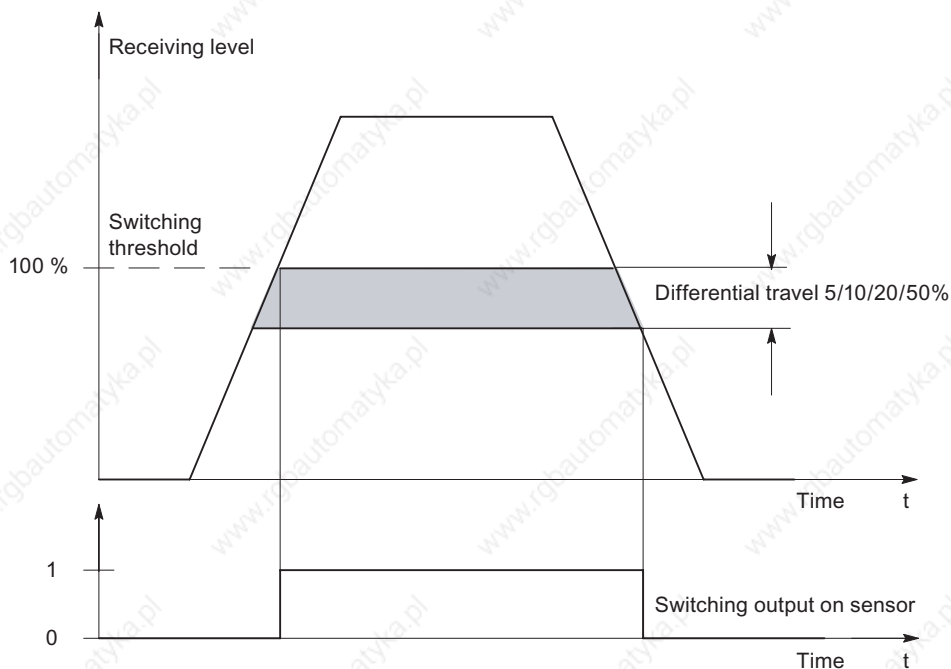


Figure 5-2 Switching hysteresis parameter

5.2.6 Time functions, time values parameters

These parameters can be used to set the electronic module for its specific application.

Operating principle

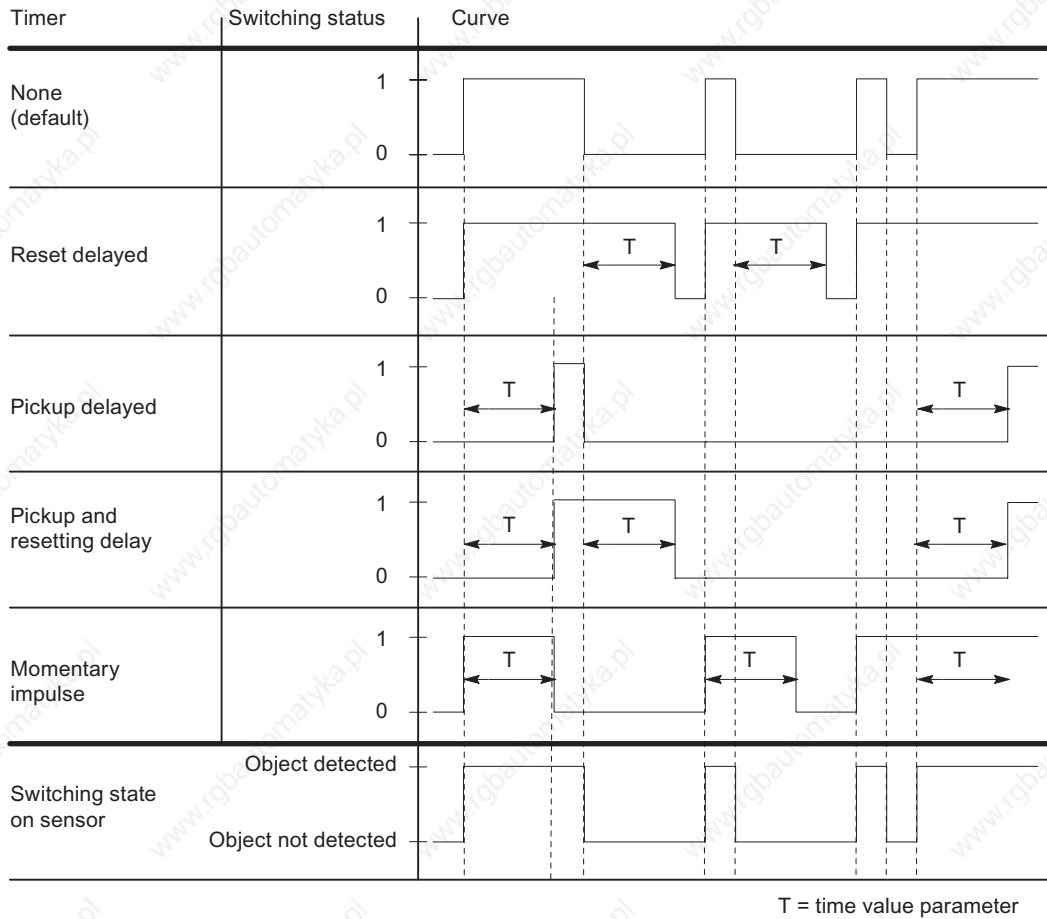


Figure 5-3 Time functions, time values parameters

5.2.7 Teach-in disable parameter

This parameter can be used to disable the *Teach in* button on the sensor.

5.3 Control interface (PIQ) and feedback interface (PII)

5.3.1 Basics of control interface (PIQ) and feedback interface (PII)

Introduction

You can configure the address space of the control and feedback interfaces of the 4 IQ-SENSE. You can choose between **Standard** and **Enhanced**.

Standard features

- The 4 IQ-SENSE occupies 4 bits in the feedback interface.
- You can evaluate the circuit state of each channel using the feedback interface.

Enhanced features

- The 4 IQ-SENSE occupies one byte in the control interface and one in the feedback interface.
- You can use the control interface to specify the sensitivity and distance values for each channel (*IntelliTeach* via "IQ-SENSE Opto" FB) and execute *Teach-in*.
- You can use the feedback interface to evaluate the acquired sensitivity and distance values (switching threshold) and the circuit state for each channel.

Requirements:

- You can use the "IQ-SENSE Opto" function block. The FB facilitates easy access to the control and feedback interface.
- Please note that in this case PII equals PIQ.
- You can download the function block and the relevant product information on the Internet at http://www.ad.siemens.de/csi_e/gsd.

Configuring the address space

| Address area | With STEP 7 as of V5.1, Service Pack 3 | With STEP 7 as of V4.02 or COM PROFIBUS or other configuration software |
|--------------|---|---|
| Standard | In the hardware catalog of HW Config, choose 4 IQ-SENSE Opto S | From the GSD file, choose S 6ES7138-4GA00-0AB0 IQ-SENSE Opto |
| Enhanced | In the hardware catalog of HW Config, choose 4 IQ-SENSE Opto E | From the GSD file, choose E 6ES7138-4GA00-0AB0 IQ-SENSE Opto |

5.3.2 Standard

Feedback interface (PII)

Table 5-4 Standard feedback interface

| Address | Assignment |
|---------|---|
| Bytes 0 | Bit 7: 0 (not assigned) |
| | Bit 6: 0 (not assigned) |
| | Bit 5: 0 (not assigned) |
| | Bit 4: 0 (not assigned) |
| | bit 3: Circuit state sensor on channel 3 1: Object detected 0: Object not detected |
| | Bit 2: Circuit state sensor on channel 2 1: Object detected 0: Object not detected |
| | Bit 1: Circuit state sensor on channel 1 1: Object detected 0: Object not detected |
| | bit 0: Circuit state sensor on channel 0 1: Object detected 0: Object not detected |

5.3.3 Enhanced

Feedback interface (PII)

Table 5-5 Enhanced feedback interface

| Address | Assignment | | Designation on "IQ-SENSE Opto" FB |
|---|------------------------|---|-----------------------------------|
| Byte 0 | Bit 0: | Circuit state sensor on channel 0 1: Object detected 0: Object not detected | Q_CH0 |
| | bit 1 to bit 7: | Acquired sensitivity/distance value at channel 0 by Teach in ¹ | TEACH_VAL_OUT |
| Byte 1 | Bit 0: | Circuit state sensor on channel 1 1: Object detected 0: Object not detected | Q_CH1 |
| | bit 1 to bit 7: | Acquired sensitivity/distance value at channel 1 by Teach in ¹ | TEACH_VAL_OUT |
| Byte 2 | Bit 0: | Circuit state sensor on channel 2 1: Object detected 0: Object not detected | Q_CH2 |
| | bit 1 to bit 7: | Acquired sensitivity/distance value at channel 2 by Teach in ¹ | TEACH_VAL_OUT |
| Byte 3 | Bit 0: | Circuit state sensor on channel 3 1: Object detected 0: Object not detected | Q_CH3 |
| | bit 1 to bit 7: | Acquired sensitivity/distance value at channel 3 by Teach in ¹ | TEACH_VAL_OUT |
| ¹ The current sensitivity/distance value is entered: - After teach-in is completed on the sensor - After teach-in is completed via the "IQ-SENSE Opto" | | | |

Control interface (PIQ)

Table 5-6 Enhanced control interface

| Address | Assignment | Designation on "IQ-SENSE Opto" FB |
|---------|---|-----------------------------------|
| Byte 0 | Specify sensitivity/distance value on channel 0 <ul style="list-style-type: none"> • bit 0: 1: Transfer sensitivity/distance value to the sensor on channel 0 (using rising edge) 0: De-activated • bit 1 to bit 7: Specify sensitivity/distance value on channel 0: 1 to 126 (sensor-dependent) | WR_TEACH_VAL TEACH_VAL_IN |
| | Teach-in on the sensor on channel 0 <ul style="list-style-type: none"> • bit 0: 1: Start teach-in on the sensor on channel 0 (at the rising edge) 0: De-activated • Bit 1 to 7: 0 | START_TEACH |
| Byte 1 | Specify sensitivity/distance value on channel 1 <ul style="list-style-type: none"> • bit 0: 1: Transfer sensitivity/distance value to the sensor on channel 1 (using rising edge) 0: De-activated • bit 1 to bit 7: Specify sensitivity/distance value on channel 1: 1 to 126 (sensor-dependent) | WR_TEACH_VAL TEACH_VAL_IN |
| | Teach-in on the sensor on channel 1 <ul style="list-style-type: none"> • bit 0: 1: Start teach-in on the sensor on channel 1 (at the rising edge) 0: De-activated • Bit 1 to 7: 0 | START_TEACH |
| Byte 2 | Specify sensitivity/distance value on channel 2 <ul style="list-style-type: none"> • bit 0: 1: Transfer sensitivity/distance value to the sensor on channel 2 (using rising edge) 0: De-activated • bit 1 to bit 7: Specify sensitivity/distance value on channel 2: 1 to 126 (sensor-dependent) | WR_TEACH_VAL TEACH_VAL_IN |
| | Teach-in on channel 2 <ul style="list-style-type: none"> • bit 0: 1: Start teach-in on the sensor on channel 2 (at the rising edge) 0: De-activated • Bit 1 to 7: 0 | START_TEACH |

| Address | Assignment | Designation on "IQ-SENSE Opto" FB |
|---------|---|-----------------------------------|
| Byte 3 | Specify sensitivity/distance value on channel 3 <ul style="list-style-type: none"> bit 0: 1: Transfer sensitivity/distance value to the sensor on channel 3 (using rising edge) 0: De-activated bit 1 to bit 7: Specify sensitivity/distance value on channel 3: 1 to 126 (sensor-dependent) | WR_TEACH_VAL TEACH_VAL_IN |
| | Teach-in on the sensor on channel 3 <ul style="list-style-type: none"> bit 0: 1: Start teach-in on the sensor on channel 3 (at the rising edge) 0: De-activated Bit 1 to 7: 0 | START_TEACH |

Principle of operation: Specifying a sensitivity/distance value (IntelliTeach)

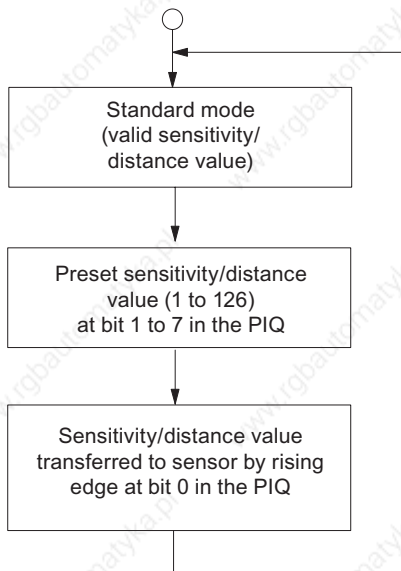


Figure 5-4 Principle of operation: Specifying a sensitivity/distance value (IntelliTeach)

Principle of operation: Teach-in

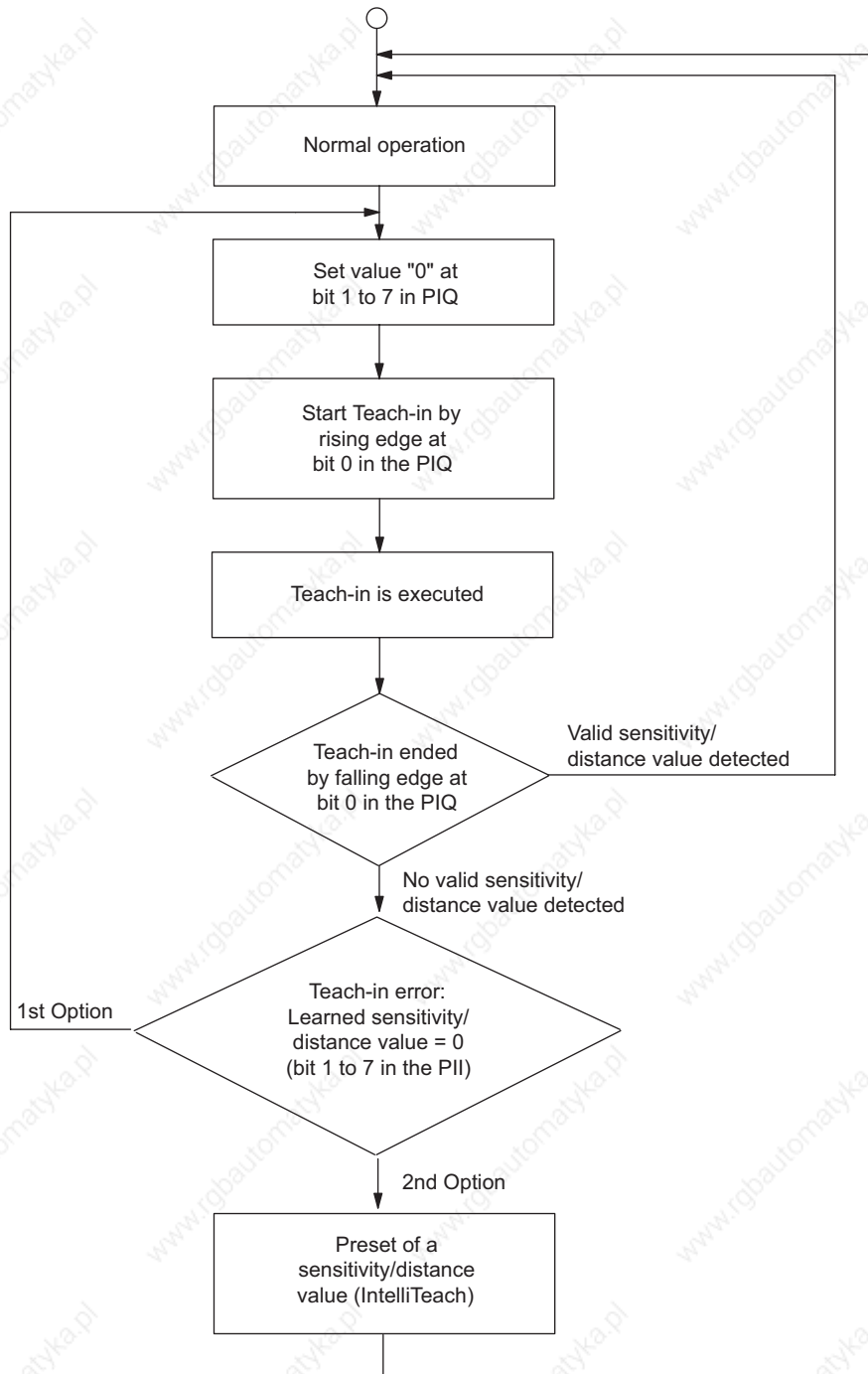


Figure 5-5 Principle of operation: Teach-in

5.4 Technical Specifications




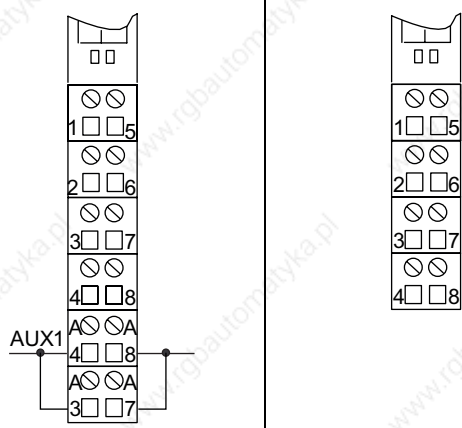
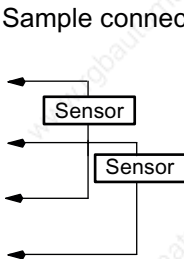
General terminal assignment

Note

Terminals A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 4 IQ-SENSE (6ES7138-4GA00-0AB0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₂₊ | 6 | M ₃₊ | |
| 3 | M ₀₋ | 7 | M ₁₋ | |
| 4 | M ₂₋ | 8 | M ₃₋ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 4 IQ-SENSE (6ES7138-4GA00-0AB0) | | |
|---|--------------------------------------|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) |  Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) |  Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) |  Fast Connect |
|  | | <p>Sample connection</p>  |

Note

The terminals to the sensors are protected against polarity reversal.

The maximum wire cross-section for the sensors is 0.25 mm².

Connection cables for the sensors can be found in the *ET 200S Operating Instructions in the section with order numbers.*

Block diagram

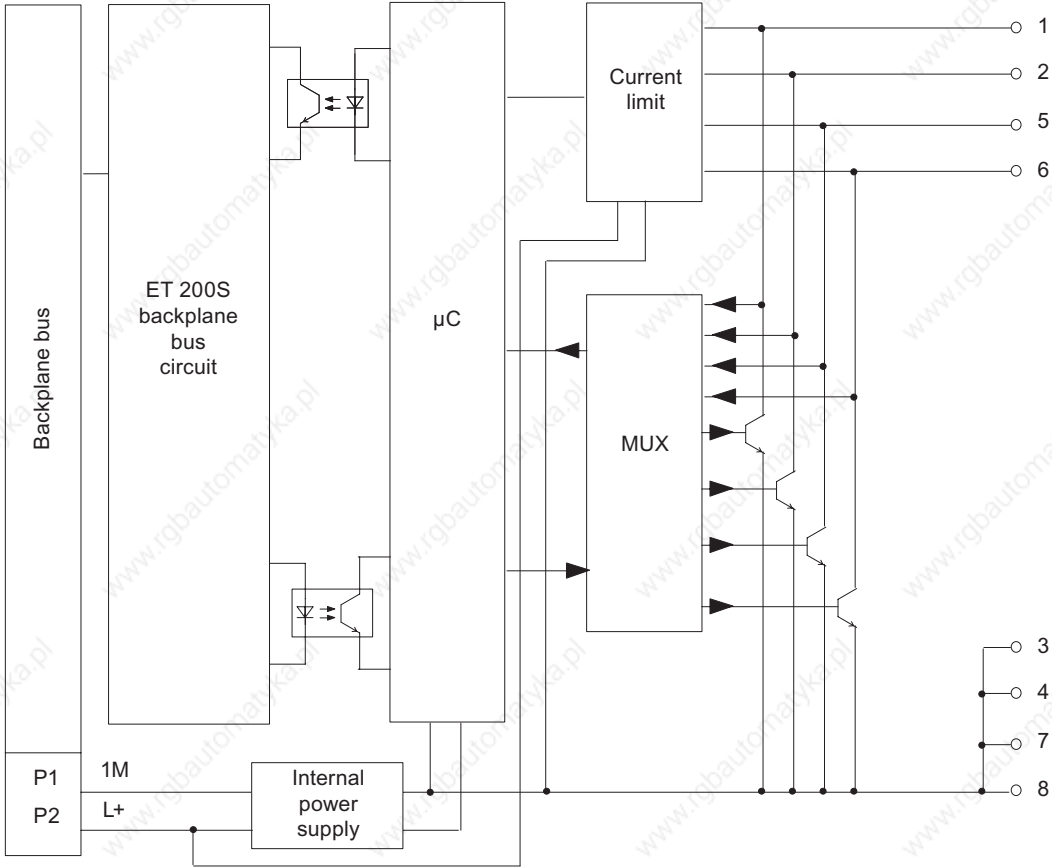


Figure 5-6 Block diagram of the 4 IQ-SENSE

4 IQ-SENSE Technical Specifications (6ES7138-4GA00-0AB0)

| Dimensions and Weight | |
|--|--|
| Dimensions W x H x D (mm) | 15 x 81 x 52 |
| Weight | Approx. 35 g |
| Data for specific modules | |
| Supports isochronous operation | no |
| Number of inputs | 4 |
| Cable length | |
| • Unshielded | max. 50 m |
| • Shielded | max. 50 m |
| Parameter length | 16 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Galvanic isolation | |
| • Between the channels | no |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • From supply voltage | max. 0.3 A |
| Power dissipation of the module | Typically 0.85 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | |
| • Group error | Red "SF" LED |
| • Diagnostic information can be displayed | Yes |
| Data for selecting a sensor | |
| Connectable sensors | Photoelectric proximity switches with IQ-Sense |
| Response Times | |
| Cycle time | max. 3.24 ms |

Reference

For information on the order numbers for connection cables for the 4 IQ-SENSE electronic modules see the *section on order numbers* in the *ET 200S Operating Instructions*.

Potential distributor module

6.1 Potential distributor module 4POTDIS (6ES7138-4FD00-0AA0)

Characteristics

- Potential distributor module with 4 outputs
- Output current 5A per output / 10A per module
- Rated load voltage: In accordance with the load voltage at the power module of this load voltage group

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 4POTDIS (6ES7138-4FD00-0AA0) | | | | |
|--|------------|----------|------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | L | 5 | L | <ul style="list-style-type: none"> • L: Load voltage in accordance with Terminals 2, 6 of the PM-E • M: Potential in accordance with Terminals 3, 7 of the PM-E • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 V AC) |
| 2 | L | 6 | L | |
| 3 | M | 7 | M | |
| 4 | M | 8 | M | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

6.1 Potential distributor module 4POTDIS (6ES7138-4FD00-0AA0)

Usable terminal modules

| Usable terminal modules for 4POTDIS (6ES7138-4FD00-0AA0) | | | | |
|--|--------------------------------------|--------------------------------------|--------------------------------------|---------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Connection example</p> |

Block diagram

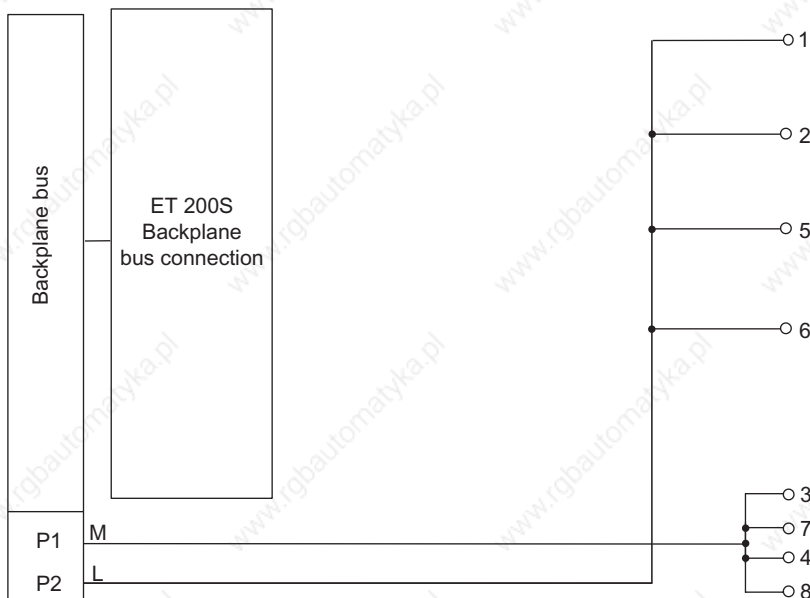


Figure 6-1 Block diagram of the 4POTDIS

Technical specifications

| Dimensions and Weight | |
|--|-------------------------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 33g |
| Module-specific data | |
| Supports isochronous operation | No |
| Number of outputs | 4 |
| Cable lengths | |
| • Unshielded | max. 600m |
| • Shielded | max. 1000m |
| Parameter length | 1 byte |
| Voltages, currents, potentials | |
| Rated load voltage L+ (from the power module) | 24 to 48 VDC 24 to 230 VAC |
| • Reverse battery protection | No |
| Total current of the outputs (per module) | max. 10 A |
| Electrical isolation | |
| • Between the channels | No |
| • Between the channels and backplane bus | Yes |
| Permitted potential difference | |
| • Between the supply voltage and backplane bus | 75 VDC, 240 VAC |
| Insulation tested | Yes |
| • Between the supply voltage and backplane bus | 500 VDC, 1500 VAC |
| Diagnostic interrupt | No |
| Data for selecting an actuator | |
| Short-circuit protection of the output | No, possible via PM-E or externally |

Note

If further modules are positioned between the power module PM-E and the potential distributor module 4POTDIS, the total current is reduced by the value of the currents of the individual modules.

Potential distributor module

6.1 Potential distributor module 4POTDIS (6ES7138-4FD00-0AA0)

RESERVE modules

Properties

The RESERVE module has the following characteristic features:

- Suitable for all TM-E terminal modules (installation widths 15 mm and 30 mm).
- reserved for a slot on any electronic module.
Insert the RESERVE module in the reserved slot of the ET 200S configuration.

Note

Pay attention to the following with the IM151 (6ES7151-1AA01-0AB0, 6ES7151-1AA02-0AB0), IM 151 FO (6ES7151-1AB00-0AB0, 6ES7151-1AB01-0AB0) and IM151/CPU (6ES7151-7AA00-0AB0):

- If you remove an electronic module during operation of the ET 200S and replace it with a RESERVE module, you must then cycle the supply voltage (power OFF/power ON) on the interface module.

Pay attention to the following with the IM151 (6ES7151-1AA00-0AB0):

- The RESERVE module cannot be used in the ET 200S.
-

Parameter assignment (without option handling)

- In *STEP 7* or *COM PROFIBUS*, assign parameters to the electronic module you want to use for future applications, such as 4DI 24 VDC High Feature, on the slot of the RESERVE module.
 - Drag the module to the configuration table
 - Assign the parameters
- Parameterize the interface module as follows:

| Parameters | Setting |
|---|---------|
| Operation at Preset <> Actual Configuration | Enable |

- If you have assigned parameters to an electronic module with inputs for the RESERVE module, the following substitute values are reported:
 - Digital input modules:0
 - Analog input modules: 7FFF_H
 - Function module:0

Note

If you use RESERVE modules:

- The SF LED lights up on the interface module
 - A channel-specific diagnostic and module status "10B: Wrong module" are reported for the RESERVE module slot.
-

Pin assignment

The RESERVE module has no connection to the terminals of the TM-E terminal module. This enables you to fully wire the TM-E terminal module and prepare it for the subsequent application.

RESERVE Module Technical Specifications (6ES7138-4AAx1-0AA0)

| Dimensions and Weight | |
|---------------------------------|--|
| Dimension W x H x D (mm) | 15 x 81 x 52 30 x 81 x 52 |
| Weight | Approx. 33 g (installation width 15 mm) Approx. 55 g (installation width 30 mm) |
| Voltages, currents, potentials | |
| Power dissipation of the module | Typically 0.025 W |
| Status, interrupts, diagnostics | |
| Status display | no |
| Diagnostics function | no |

Note

The address space must correspond with the address space of the planned electronic module.

Reference

For information on the option handling and implementation of RESERVE modules can be found in the *ET 200S Operating Instructions in Functions > Option Handling on the PROFIBUS DP*.

Glossary

Aggregate current

Total of all currents of all output channels of a digital output module.

Automation system

An automation system is a programmable control system, consisting of at least one CPU, various input and output modules as well as operating and monitoring devices.

AUX1 bus

Power modules permit you to connect any additional potential (up to 230 VAC), which you can apply by means of the AUX(iliary) bus. You can use the AUX(iliary) bus as required:

- As a protective conductor bar
- For additional voltage when required

Backplane bus

The backplane bus is a serial data bus via which the interface module IM 151-1 communicates with the electronic modules/motor starters and supplies them with the necessary voltage. The connection between the individual modules is established by means of the terminal modules.

Baud rate

The Baud rate is the speed at which data is transmitted and specifies the number of bits transmitted per second (Baud rate = bit rate).

In the case of the ET 200S, baud rates of 9.6 kBaud to 12 MBaud are possible.

Bus

A common transfer route connecting all nodes and having two defined ends.

In the case of the ET 200, the bus is a two-wire or fiber-optic cable.

Bus connector

A physical connection between the bus node and the bus line.

Configuration

The systematic arrangement of the different ET 200S modules (setup).

Connecting to common potential

The opening of a new voltage group by a power module. This enables individual connection of the sensor and load supply to common potential.

Device names

Before an IO device can be addressed by an IO controller, it must have a device name. This procedure was selected for PROFINET because names are easier to handle than complex IP addresses.

Assignment of a device name for a concrete IO device can be compared with the setting of the PROFIBUS address for a DP slave.

An IO device does not have a device name upon delivery. An IO device can only be addressed by an IO controller - i.e., for transferring configuration data (including the IP address) during startup or for user data exchange during cyclic operation - after it has been assigned a device name with the programming device/PC.

Diagnostics

Diagnostics involves the identification, localization, classification, display, and further evaluation of errors, faults, and messages.

Diagnostics provides monitoring functions that run automatically while the system is in operation. This increases the availability of systems by reducing setup times and downtimes.

Direct starter

A direct starter is a → motor starter that switches a motor on and off directly. It consists of a circuit breaker and a contactor.

Distributed IO systems

are input/output units which are not deployed in the central device, but which are set up decentrally at a greater distance from the CPU, e. g.:

- ET 200M, ET 200X, ET 200L, ET 200S
- DP/AS-I Link
- Other DP slaves either from Siemens or other manufacturers

The distributed IO systems are connected to the DP master by means of PROFIBUS DP.

DP master

A → master that acts in compliance with the IEC 61784-1:2002 Ed1 CP 3/1 standard is termed DP master.

DP slave

A → slave, which is operated with the PROFIBUS DP protocol and acts according to the Norm IEC 61784-1:2002 Ed1 CP 3/1, is known as a DP slave.

DP standard

DP standard is the bus protocol of the ET 200 distributed I/O system according to the IEC 61784-1:2002 Ed1 CP 3/1 standard.

Electronic module

Electronic modules make inputs and outputs available for process signals. There are digital and analog electronic modules.

Equipotential Bonding

Electrical connection (equipotential bonding conductor) that brings the conductive parts of electrical equipment and other conductive parts to the same or approximately the same potential in order to prevent troublesome or dangerous voltages arising between these parts.

ET 200

The ET 200 distributed IO system with the PROFIBUS DP protocol enables distributed IO devices to be connected to a CPU or an appropriate DP master. ET 200 is distinguished by fast response times, since only few data (bytes) are transferred.

ET 200 is based on the IEC 61784-1:2002 Ed1 CP 3/1 standard.

The ET 200 works on the master/slave principle. A DP master can be for example the master switch-on system IM308-C or the CPU, 315-2 DP.

DP slaves can be the distributed IO system ET 200M, ET 200X, ET 200L, ET 200S or DP slaves from Siemens or other manufacturers.

Firmware update

Updating the firmware of the interface module

After (compatible) extensions of functions of improvements to performance, the interface module can be updated to the most recent firmware version.

FREEZE

This is a control command of the DP master to a group of DP slaves.

When a DP slave receives the FREEZE control command, it freezes the current status of the **inputs** and transfers them cyclically to the DP master.

After each new FREEZE control command, the DP slave freezes the status of the **inputs** again.

The input data is not transferred from the DP slave to the DP master again cyclically until the DP master sends the UNFREEZE control command.

Frequency converter

The frequency converter implements infinite control of the speed of asynchronous motors. It controls both simple drive tasks (frequency control) and more sophisticated ones (vector control). It can also be used to control torque.

Ground

The conductive mass of earth, the electrical potential of which can be set equivalent to zero at all points. In the vicinity of grounding electrodes, the potential may not be zero. The term "reference ground" is often used in this case.

The ground refers to all the interconnected inactive parts of a piece of equipment that, even in the event of a fault, cannot pick up voltage that is dangerous to the touch.

Grounding

Grounding means connecting an electrically conductive part to a grounding electrode by means of a grounding system.

GSD file

The properties of a PROFINET device are described in a GSD file (General Station Descriptor), which contains all the information required for configuration.

Just as with PROFIBUS you can integrate a PROFINET device via a GSD file in STEP 7.

In PROFINET IO, the GSD file is always in XML format. The structure of the GSD file corresponds to ISO 15734, the worldwide standard for device descriptions.

In the case of PROFIBUS the GSD file is available in the ASCII format (in compliance with the IEC 61784-1:2002 Ed1 CP 3/1 standard).

Hot swapping

This is the removal and insertion of modules while the ET 200S is in operation.

Identification Data

Identification data are data that are stored in a module for assisting the user in:

- Checking the system configuration
- Locating hardware modifications in a system
- Correcting errors in a system

Identification data enable modules to be uniquely identified online.

IO modules

IO modules include all modules of an ET 200S inserted after the interface module. These include power modules, electronic modules, technological modules, motor starters, frequency converters.

Isolated

In the case of isolated input/output modules the reference potentials of the control circuit and the load current circuit are galvanically isolated; e.g. by means of optocouplers, relays or transformers. Input/output circuits can be grouped.

MAC address

Each PROFINET device has a factory-assigned worldwide unique device identification. This 6-byte device identification is the MAC address.

The MAC address consists of:

- 3-byte manufacturer ID
- 3-byte device ID (serial number)

As a rule the MAC is placed legibly on the front of the device
e. g.: 08-00-06-6B-80-C0

Master

When it has a token, a master can send data to and request data from other nodes (= active participants). Examples of DP masters are the CPU 315-2 DP or the IM308-C.

Motor starter (MS)

Motor starter is the generic term for → direct and → reversing starters. The startup and direction of rotation of a motor are determined by motor starters.

Node

Device which can send, receive or enhance data via the bus,
e. g. DP-Master, DP-Slave, RS 485-Repeater.

Non-isolated

In the case of non-isolated input/output modules, the reference potentials of the control and load circuits are electrically connected.

Parameter assignment

Parameter assignment is the transfer of slave parameters from the DP master to the DP slave.

PELV

Protective Extra Low Voltage = extra low voltage with safe isolation

Power buses (P1/ P2)

Two internal buses (P1 and P2) that supply the electronic modules with voltage. The power buses are fed by the power module and connected by means of the terminal modules.

Power modules

Power modules monitor the voltage supply for all electronic modules within the voltage group. The supply voltage for the voltage group is fed in via the terminal module TM-P

Prewiring

The wiring of the terminal modules before the electronic modules are inserted.

Process image

The process image is a component of the system memory of the DP master. The signal states of the input modules are transferred to the process-image inputs at the beginning of the cyclic program. At the end of the cyclic program, the values of the process-image outputs are transferred to the DP slave as the signal states.

PROFIBUS

PROcess Field BUS, Process and fieldbus standard, defined in the IEC 61784-1:2002 Ed1 CP 3/1 standard. It defines functional, electrical, and mechanical properties for a bit-serial field bus system.

PROFIBUS is available with the protocols DP (= distributed peripherals, that is, distributed or remote IO), FMS (= field bus message specification), PA (= process automation), or TF (= technological functions).

PROFIBUS address

Each bus node must receive a PROFIBUS address to identify it uniquely on the PROFIBUS.

The PC/programming device has the PROFIBUS address "0".

PROFIBUS addresses 1 to 125 are permissible for the ET 200S distributed IO system

PROFINET

Within the context of Totally Integrated Automation (TIA), PROFINET is the systematic continuation of the following systems:

- PROFIBUS DP, the established field bus
- Industrial Ethernet, the communication bus for the cell level

Experiences from both systems have been and are being integrated in PROFINET.

As an Ethernet-based automation standard of PROFIBUS International (formerly PROFIBUS user organization, registered society) PROFINET thus defines a communication, automation and engineering model valid for all manufacturers.

PROFINET components

A PROFINET component includes all data of the hardware configuration, the parameters of the modules, and the associated user program. The PROFINET component comprises the following elements:

- Technological function

The (optional) technological (software) function includes the interface to other PROFINET components as interconnectable inputs and outputs.

- Device

The device represents the physical automation device or field device, including the IO, sensors and actuators, mechanical system, and device firmware.

PROFINET device

A PROFINET device always has at least one Industrial Ethernet connection. Additionally, a PROFINET device can have a PROFIBUS connection: as master with proxy functions. In exceptional cases the PROFINET device can have several PROFIBUS connections (e. g. CP 5614).

PROFINET IO controller

Device by means of which connected IO devices are addressed. This means the IO controller exchanges input and output signals with assigned field devices. The IO controller is often the controller in which the automation program is executed.

PROFINET IO

Within the context of PROFINET, PROFINET IO is a communication concept for implementing modular, distributed applications.

With PROFINET IO, you can create automation solutions using the trusted and familiar methods of PROFIBUS.

Implementation of PROFINET IO is effected on the one hand via the PROFINET standard for automation devices and, on the other by means of the engineering tool, STEP 7.

This means that in STEP 7 you have the same application view irrespective of whether you are configuring PROFINET or PROFIBUS devices. The programming of your user program is identical for PROFINET IO and PROFIBUS DP if you are using the blocks and system status lists which have been extended for PROFINET IO.

PROFINET IO Device

Distributed field device assigned to one of the IO controllers (e.g. remote IO, valve islands, frequency converters, switches).

Provider-consumer principle

By contrast with PROFIBUS DP, both partners on the PROFINET IO are independent providers in the sending of data.

Real time

Real time means that a system processes external events within a defined time.

Determinism means that a system responds in a predictable (deterministic) manner.

Both requirements are important for industrial networks. PROFINET satisfies these requirements. Thus, as a deterministic real-time network, PROFINET is designed as follows:

- The transfer of time-critical data between different nodes via a network is guaranteed within a defined interval of time.
- To this end, PROFINET has an optimized communication channel for real time communication: Real time
- The time of transfer can be accurately determined.(forecast).
- This ensures that unimpeded communication can take place via other standard protocols in the same network, e.g. industrial communication for PD/PC.

Reference potential

Potential from which the voltages of the circuits involved can be observed and/or measured.

Reversing starter

A reversing starter is a → motor starter which defines the rotary direction of a motor. It consists of a circuit breaker and two contactors.

Segment

The bus line between two terminating resistors forms a segment. A segment contains 0 to 32 → bus nodes Segments can be coupled via RS 485 repeaters.

SELV

Protective Extra Low Voltage = extra low voltage with safe isolation

Slave

A slave may only exchange data with a → master if called upon to do so by the latter. Slaves are, for example all DP slaves such as ET 200X, ET 200M, ET 200S etc.

SNMP

SNMP (Simple Network Management Protocol) is the standardized protocol, for diagnosing and also configuring the Ethernet network infrastructure.

In the office setting and in automation engineering, devices from many different manufacturers support SNMP on the Ethernet.

SNMP-based applications can be operated on the same network in parallel to applications with PROFINET.

The scope of the supported functions differs depending on the device type. For example, a switch has more functions than a CP 1616.

SSI

The transfer of path information takes place synchronously according to the SSI protocol (Synchronous Serial Interface). The SSI protocol is used with absolute position sensors.

SSL (System Status List)

The System Status List SSL describes the current status of the automation system: It gives an overview of the setup, the current parameter settings, the actual statuses and processes in the CPU and the assigned modules.

The data of the SSL can only be read and not modified.

Stationary wiring

All the wiring-carrying elements (terminal modules) are mounted on a rail. The power and electronic modules are plugged onto the terminal modules.

Switch

PROFIBUS is a linear network. The communication nodes are connected with one another by means of a passive line - the bus.

By contrast, the Industrial Ethernet consists of point-to-point connections: each communication node is directly connected to exactly one communication node.

If a communication node is connected with several communication nodes, this communication node is connected to the port of an active network component - the switch. Additional communication nodes (including switches) can now be connected to the other ports of the switch. The connection between a communication node and the switch remains a point-to-point connection.

A switch also has the task of regenerating and distributing received signals. The switch "learns" the Ethernet address(es) of a connected PROFINET device or other switches and only forwards signals, which are destined for the connected PROFINET device or the connected switch.

A switch has a specific number of ports. You connect at most one PROFINET device or additional switch to each port.

SYNC

This is a control command of the DP master to a group of DP slaves.

With the SYNC control command the DP master prompts the DP slave to freeze the statuses of the outputs at the value at that moment. With the subsequent frames, the DP slave stores the output data, but the statuses of the outputs remain unchanged.

After each new SYNC control command, the DP slave sets the outputs that it has stored as output data. The outputs are not cyclically updated again until the DP master sends the UNSYNC control command.

Technological modules

Modules which are equipped with technological functions, e.g. counting pulses, positioning functions, control of step-action motor power sections.

Terminal modules

Terminal modules implement the electrical and mechanical connection of the distributed IO modules with the interface module and the terminating module.

The inserted distributed IO module determines the signals on the terminals of the terminal module. Depending on the terminal module which has been selected, only certain terminals are available.

Terminating module

The terminating module completes the ET 200S distributed IO system. If you have not inserted a terminating module, the ET 200S is not ready for operation.

User data qualifier

Each IO module is assigned a value in the input or output data message; this value makes a statement on the quality of this user datum. For example, outputs of a specific module can be switched off by means of this without affecting other modules.

Voltage group

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SIEMENS

SIMATIC

Distributed I/O system ET 200S

Product Information

Introduction

1

**New Information About the
"ET 200S Distributed I/O
System Operating
Instructions"**

2

**New Information About the
"ET 200S Distributed I/O
System Manual"**

3

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.



Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.



Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.



Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:



Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1

This product information describes supplements to the *ET 200S Distributed I/O System Operating Instructions* (A5E00515770-03), release 12/2005 and to the *ET 200S Distributed I/O System Manual* (A5E00514526-03), release 12/2005.

The chapter number mentioned in this product information refer to the chapters in the ET 200S Distributed I/O System Operating Instructions (A5E00515770-03), release 12/2005 and to the ET 200S Distributed I/O System Manual (A5E00514526-03), release 12/2005.

New Information About the "ET 200S Distributed I/O System Operating Instructions"

2

Introduction

This information is new and replaces the information in Sections 7.4, 8.1.3, 8.2.3 and 8.1.4.10 in the *ET 200S Distributed I/O System Operating Instructions* (A5E00515770-03), release 12/2005.

2.1 Identification Data

7.4 Identification Data

Reading of identification data

Table 2-1 Identification Data

| Identification Data | Access | Default setting | Explanation |
|---|-----------------|-----------------------|--|
| Identification data 0: Index 1 (Data record 231) | | | |
| MANUFACTURER_ID | Read (2 bytes) | 2A hex (= 42 dec) | The name of the manufacturer is stored here. (42 dec = SIEMENS AG) |
| ORDER_ID | Read (20 bytes) | Depends on the module | Order number of the module |
| SERIAL_NUMBER | Read (16 bytes) | not relevant | |
| HARDWARE_REVISION | Read (2 bytes) | not relevant | |
| SOFTWARE_REVISION | Read (4 bytes) | Firmware version | This indicates the firmware version of the module. |
| REVISION_COUNTER | Read (2 bytes) | - | Provides information on parameter modifications on the module. |
| PROFILE_ID | Read (2 bytes) | F600 hex | Generic Device |
| PROFILE_SPECIFIC_TYPE | Read (2 bytes) | 0003 hex 0005 hex | On electronic modules on interface modules |
| IM_VERSION | Read (2 bytes) | 0101 hex | Provides information on the ID data version (0101 hex = version 1.1) |
| IM_SUPPORTED | Read (2 bytes) | 000E hex | Provides information on existing identification data (index 2 to 4) |

2.2 Evaluating the Interrupts of the ET 200S

| Identification Data | Access | Default setting | Explanation |
|--|-----------------------|-----------------|---|
| Maintenance data 1: Index 2 (Data record 232) | | | |
| TAG_FUNCTION | Read/write (32 bytes) | - | Define a unique identifier for the module in this record. |
| TAG_LOCATION | Read/write (22 bytes) | - | Enter the installation location of the module here. |
| Maintenance data 2: Index 3 (data record 233) | | | |
| INSTALLATION_DATE | Read/write (16 bytes) | - | Enter the installation date of the module here. |
| RESERVED | Read/write (38 bytes) | - | Reserved |
| Maintenance data 3: Index 4 (data record 234) | | | |
| DESCRIPTOR | Read/write (54 bytes) | - | Enter a comment on the module here. |

2.2 Evaluating the Interrupts of the ET 200S

8.1.3 Evaluating the Interrupts of the ET 200S

"Process interrupt lost" Diagnostics

The "Process interrupt lost" diagnostics is not available for modules at present.

Note

Process interrupts should not be used for technological purposes (e.g. cyclical generation of process interrupts).

If more than approximately 90 process interrupts are generated per second, process interrupts may be lost.

2.3 Evaluating the Interrupts of the ET 200S

8.1.3 Evaluating the Interrupts of the ET 200S

"Process interrupt lost" Diagnostics

The "Process interrupt lost" diagnostics is not available for modules at present.

Note

Process interrupts should not be used for technological purposes (e.g. cyclical generation of process interrupts).

If more than approximately 90 process interrupts are generated per second, process interrupts may be lost.

2.4 Interrupts

8.1.4.10 Interrupts

Process interrupt of analog input modules

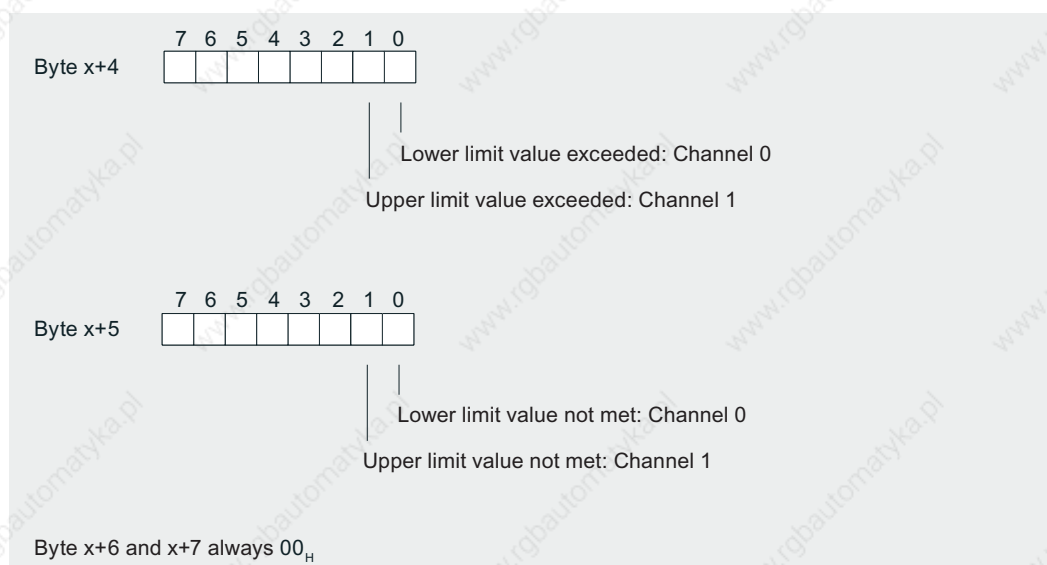


Figure 2-1 Structure as of Byte x+4 and Byte x+5 for process interrupt (analog input)

2.4 Interrupts

New Information About the "ET 200S Distributed I/O System Manual"

3

Introduction

This information is new and replaces the information in Sections 4.5.2, 4.5.6, 4.7, 4.13, 4.20 and 4.22 in the *ET 200S I/O Distributed I/O System Manual (A5E00514526-03)*, release 12/2005.

3.1 Parameters for Analog Electronic Modules 2AI U High Feature and 2AI I 2/4WIRE High Feature

4.5.2 Parameters for Analog Electronic Modules 2AI U High Feature and 2AI I 2/4WIRE High Feature

Table 3-1 Parameters for analog electronic input modules U, I High Feature

| 2AI U High Feature | 2AI I 2/4WIRE High Feature | Value range | Default setting | Range of efficiency |
|--|--------------------------------------|--|---------------------|---------------------|
| Group diagnostics (parameter assignment error, internal error) | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Diagnostics: Overflow/underflow | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Interference frequency suppression ³ | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Diagnostics: Wire break ² | Diagnostics: Wire break ¹ | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |
| Smoothing ³ | | <ul style="list-style-type: none"> • None • Weak • Medium • Strong | None | Channel |
| Type/range of measurement | --- | <ul style="list-style-type: none"> • De-activated • ± 5 V • 1 V to 5 V • ± 10 V | ± 10 V | Channel |
| --- | Type/range of measurement | <ul style="list-style-type: none"> • De-activated • 4 mA to 20 mA, 2DMU • 4 mA to 20 mA, 4DMU • ± 20 mA | 4 mA to 20 mA, 4DMU | Channel |

¹ Only in the measuring range 4 mA to 20 mA
² Only in the measuring range 1 V to 5 V
³ Not at isochronous operation

3.2 Parameters for Analog Electronic Modules 2AO U ST, 2AO U High Feature and 2AO I ST, 2AO I High Feature

3.2 Parameters for Analog Electronic Modules 2AO U ST, 2AO U High Feature and 2AO I ST, 2AO I High Feature

4.5.6 Parameters for Analog Electronic Modules 2AO U ST, 2AO U High Feature and 2AO I ST, 2AO I High Feature

Table 3-2 Parameters for analog output modules U, I

| 2AO U ST, 2AO U High Feature | 2AO I ST, 2AO I High Feature | Value range | Default setting | Range of efficiency |
|--|--------------------------------------|---|--|---------------------|
| Group diagnostics (parameter assignment error, internal error) | | <ul style="list-style-type: none"> • Disable • Enable | Disable | Module |
| Behavior in event of CPU/master STOP | | <ul style="list-style-type: none"> • No output current and voltage • Switch substitution value • Keep last value | No output current and voltage | Module |
| Diagnostics: Short-circuit to M ¹ | --- | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |
| --- | Diagnostics: Wire break ¹ | <ul style="list-style-type: none"> • Disable • Enable | Disable | Channel |
| Type/range of output | --- | <ul style="list-style-type: none"> • De-activated • 1 V to 5 V • ± 5V • ± 10 V | ± 10 V | Channel |
| --- | Type/range of output | <ul style="list-style-type: none"> • De-activated • 4 mA to 20 mA • ± 20 mA | 4 mA to 20 mA | Channel |
| Substitute value ² | | To 65535 (value range must be within the nominal range) | ± 10 V: 0 V ± 20 mA: 0 mA 4 mA to 20 mA: 4 mA 1 V to 5 V: 1 V | Channel |

¹ No diagnostics recognition between -0.296 V and +0.296 V or -1.1852 mA and +1.1852 mA

² If there is no voltage going to the interface module or COMPACT module but the supply to the analog output modules continues, the substitute values that have been assigned parameters are output. Substitute values must lie within the nominal range. You can assign values from -27648 to +27648 as parameters (in the case of parameter assignment by means of the device database (GSD) file).

3.3 2AI U High Feature Analog Electronic Module (6ES7134-4LB02-0AB0)

4.7 2AI U High Feature Analog Electronic Module (6ES7134-4LB02-0AB0)

Properties

- 2 inputs for measuring voltage
- Input ranges:
 - ± 5 V, resolution 15 bits + sign
 - ± 10 V, resolution 15 bits + sign
 - 1 V to 5 V, resolution 15 bits
- Isolated from the load voltage L+
- Permitted common-mode voltage between the channels 100 VAC
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 0.7 ms
 - Minimum conversion time of the input modules: (T_{WEmin}): 0.5 ms
- Supports I&M functions

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI U High Feature (6ES7134-4LB02-0AB0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | <ul style="list-style-type: none"> • M_{n+}: Input signal "+", channel n • M_{n-}: Input signal "-", channel n • n.c.: Not connected (max. 30 VDC can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | n.c. | 7 | n.c. | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

3.3 2AI U High Feature Analog Electronic Module (6ES7134-4LB02-0AB0)

Usable terminal modules

| Usable terminal modules for 2AI U High Feature (6ES7134-4LB02-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Wiring examples</p> |

Block diagram

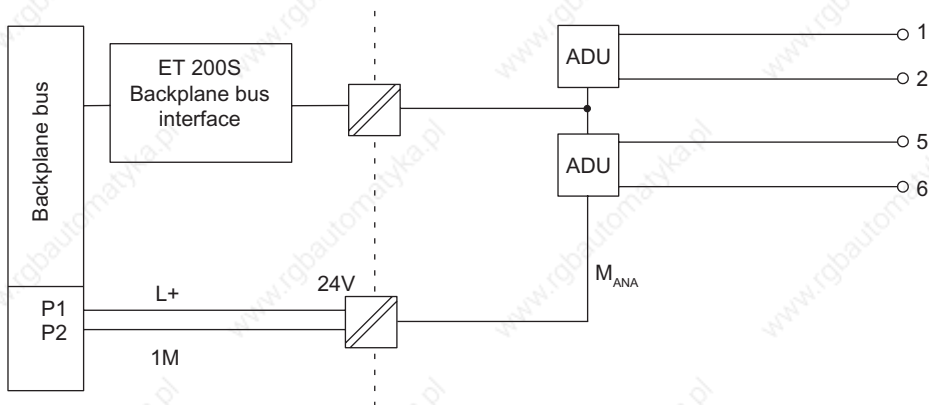


Figure 3-1 Block diagram of the 2AI U High Feature

2AI U High Feature Technical Specifications (6ES7134-4LB02-0AB0)

| Dimensions and Weights | |
|--|--------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 45 g |

| Data for specific modules | |
|---|------------------|
| Supports isochronous operation * | Yes |
| Supports I&M functions | Yes |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | Max. 200 m |
| Parameter length | 12 bytes |
| Analog value representation | S5 and S7 format |
| * Is supported if no interference frequency suppression or smoothing is configured. | |

| Voltages, Currents, Potentials | |
|---|-------------------|
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| • Supply of the measuring transducers | No |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the modules and load voltage L+ | Yes |
| • Between the channels and PE | Yes |
| • Between the channels | No |
| Permissible potential difference | |
| • Between the channels | 140 VDC / 100 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From load voltage L+ | 55 mA max. |
| Power dissipation of the module | Typically 0.85 W |

| Status, interrupts, diagnostics | |
|--|---|
| Diagnostics functions | |
| • Group error | Red "SF" LED |
| • Diagnostics functions readable | Yes |
| • Process interrupts * | Configurable, violation of upper and lower limits |
| * Process interrupts are only sent if the process interrupt mechanism is not overloaded. | |

| Analog value generation | | | |
|---|---|----|------|
| Measuring principle | Sigma-Delta | | |
| Conversion and cycle time | | | |
| • Integration time can be assigned parameters | Yes | | |
| • Interference frequency suppression in Hz | 60 | 50 | None |
| • Conversion time in ms (per channel) | 17 | 20 | 0,04 |
| • Cycle time in ms (per module) | 18 | 21 | 0,5 |
| Resolution (including overrange) | ± 10 V / 15 bits + sign ± 5 V / 15 bits + sign 1 V to 5 V / 15 bits | | |

| Suppression of interference, error limits | |
|---|--|
| Interference voltage suppression for $f = n \times (f_1 \pm 0.5 \%)$, ($f_1 =$ interference frequency) | |
| • Common-mode interference (U_{SS}) • Series-mode interference (peak interference value < rated value of input range) • Crosstalk between the inputs | Min. 100 dB Min. 90 dB Min. -100 dB |
| Operational limit (in the entire temperature range, with reference to the input range) | ± 0.1% with interference frequency suppression ± 0.2% without interference frequency suppression |
| Basic error limit (operation limit at 25°C) | ± 0.05% with interference frequency suppression ± 0.1% without interference frequency suppression |
| Temperature error (with reference to the input range) | ± 0.003 %/K |
| Linearity error (with reference to the input range) | ± 0,01 % |
| Repeatability (in steady state at 25 °C with reference to the input range) | ± 0,01 % |

| Sensor selection data | | |
|--|--|--|
| Input range (rated value) / input resistance | | |
| • Voltage | ± 10 V / min. 0.8 MΩ ± 5 V / min. 0.8 MΩ 1 V to 5 V / min. 0.8 MΩ | |
| Permitted input voltage (destruction limit) | 35 V continuous 75 V for 1 ms max., pulse duty factor 1: 20 | |
| Smoothing of the measured values | Yes, parameters can be assigned in 4 steps by means of digital filtering | |
| | Step None Weak Medium Strong | Time constant 1 x cycle time 4 x cycle time 16 x cycle time 32 x cycle time |

I&M functions

Reading of the I&M data from the module is possible with interface modules as from a higher order number (MLFB) or as from a higher firmware/product version than described in the following table:

| Interface module | Order no. | Firmware version | Product version |
|-------------------------|--------------------|------------------|-----------------|
| IM151-1 HIGH FEATURE | 6ES7151-1BA01-0AB0 | V2.0 | 02 |
| IM151-3 PN | 6ES7151-3AA20-0AB0 | V4.0 | 01 |
| IM151-3 PN HIGH FEATURE | 6ES7151-3BA20-0AB0 | V4.0 | 01 |
| IM151-3 PN FO | 6ES7151-3BB21-0AB0 | V4.0 | 01 |

3.4 2AI I 2/4WIRE High Feature Analog Electronic Module (6ES7134-4MB02-0AB0)

4.13 2AI I 2/4WIRE High Feature Analog Electronic Module (6ES7134-4MB02-0AB0)

Properties

- 2 inputs for measuring current
- Input ranges:
 - ± 20 mA, resolution 15 bits + sign
 - 4 mA to 20 mA, resolution 15 bits
- Isolated from the load voltage L+
- Permitted common-mode voltage between the channels 100 VAC
- Supports two-wire or four-wire measuring transducers
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 0.7 ms
 - Minimum conversion time of the input modules: (T_{WEmin}): 0.5 ms
- Supports I&M functions

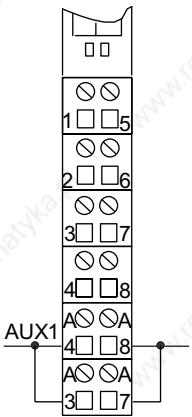
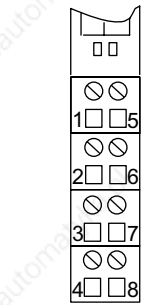
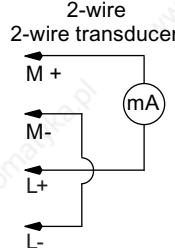
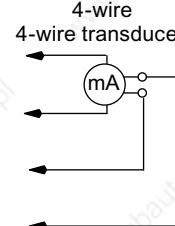
General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AI I 2/4WIRE High Feature (6ES7134-4MB02-0AB0) | | | | |
|---|-----------------|----------|-----------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | M ₀₊ | 5 | M ₁₊ | 2-wire transducer: <ul style="list-style-type: none"> M_{n+}: Input signal "-", channel n M_{n-}: connect to L- L+ Input signal "+", channel n AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) 4-wire transducer: <ul style="list-style-type: none"> M_{n+}: Input signal "+", channel n M_{n-}: Input signal "-", channel n L+ Power supply for four-wire measuring transducer L-: Return circuit for measuring transducer supply AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | M ₀₋ | 6 | M ₁₋ | |
| 3 | L+ | 7 | L+ | |
| 4 | L- | 8 | L- | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AI I 2/4WIRE High Feature (6ES7134-4MB02-0AB0) | | |
|--|--|--|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
|  |  | <p>Wiring examples</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>2-wire 2-wire transducer</p>  </div> <div style="text-align: center;"> <p>4-wire 4-wire transducer</p>  </div> </div> |

Block diagram

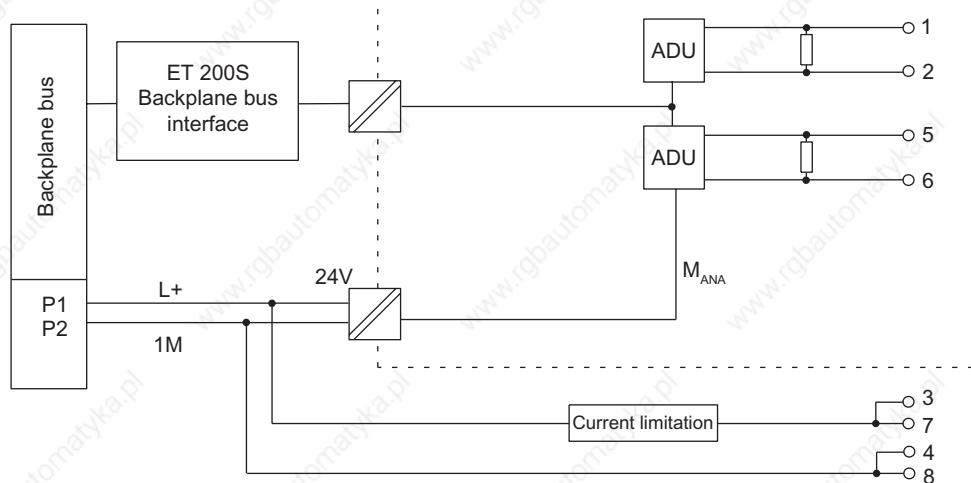


Figure 3-2 Block diagram of the 2AI I 2/4WIRE High Feature

2AI I 2/4WIRE High Feature Technical Specifications (6ES7134-4MB02-0AB0)

| Dimensions and weight | |
|--|--------------|
| Dimensions W x H x D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 45 g |

| Data for specific modules | |
|---|------------------|
| Supports isochronous operation * | Yes |
| Supports I&M functions | Yes |
| Number of inputs | 2 |
| Cable length | |
| • Shielded | Max. 200 m |
| Parameter length | 12 bytes |
| Analog value representation | S5 and S7 format |
| * Is supported if no interference frequency suppression or smoothing is configured. | |

| Voltages, currents, potentials | |
|---|---|
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Power supply of the transmitters | Yes |
| • Short-circuit protection | Yes, 60 mA (for both channels) |
| Galvanic isolation | |
| • Between the channels and backplane bus | Yes |
| • Between the modules and load voltage L+ | No at 2-wire Yes at 4-wire |
| • Between the channels and PE | Yes |
| • Between the channels | No |
| • Permissible potential difference | |
| • Between the channels | 140 VDC/100 VAC (with isolated power supply for the measuring transducer) |
| • Insulation tested | 500 VDC |
| • Current consumption | |
| • From the load voltage L+ (no sensor supply) | 48 mA max. |
| • Power dissipation of the module | Typically 1.2 W |

| Status, interrupts, diagnostics | |
|--|---|
| Diagnostics functions | |
| • Group error | Red "SF" LED |
| • Diagnostics functions readable | Yes |
| • Process interrupts * | Configurable, violation of upper and lower limits |
| * Process interrupts are only sent if the process interrupt mechanism is not overloaded. | |

| Analog value generation | | | |
|---|---|----|------|
| Measuring principle | Sigma-Delta | | |
| Conversion and cycle time | | | |
| Integration time can be assigned parameters | Yes | | |
| • Interference frequency suppression in Hz | 60 | 50 | None |
| • Conversion time in ms (per channel) | 17 | 20 | 0,04 |
| • Cycle time of the module in ms (per module) | 18 | 21 | 0,5 |
| Resolution | ± 20 mA / 15 bits + sign 4 mA to 20 mA / 15 bits | | |

| Suppression of interference, error limits | |
|--|--|
| Interference voltage suppression for $f = n \times (f_1 \pm 0.5 \%)$, ($f_1 =$ interference frequency) | |
| • Common-mode interference (U_{ss}) | Min. 100 dB |
| • Series-mode interference (peak interference value < rated value of input range) | Min. 90 dB |
| Crosstalk between the inputs | Min. -100 dB |
| Operational limit (in the entire temperature range, with reference to the input range) | ± 0.1% with interference frequency suppression ± 0.2% without interference frequency suppression |
| Basic error limit (operation limit at 25°C) | ± 0.05% with interference frequency suppression ± 0.1% without interference frequency suppression |
| Temperature error (with reference to the input range) | ± 0.003 %/K |
| Linearity error (with reference to the input range) | ± 0,01 % |
| Repeatability (in steady state at 25 °C with reference to the input range) | ± 0,01 % |

| Sensor selection data | | | | | | | | | | | |
|--|---|------|---------------|------|----------------|------|----------------|--------|-----------------|--------|-----------------|
| Input range (rated value) / measurement resistance | | | | | | | | | | | |
| • Current | Approx. 44 Ω | | | | | | | | | | |
| Permissible input current | Approx. 50 mA (can be limited electronically) | | | | | | | | | | |
| Load of the two-wire transmitter: | max. 750 Ω | | | | | | | | | | |
| Smoothing of the measured values | Yes, parameters can be assigned in 4 steps by means of digital filtering | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Step</th> <th>Time constant</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>1 x cycle time</td> </tr> <tr> <td>Weak</td> <td>4 x cycle time</td> </tr> <tr> <td>Medium</td> <td>16 x cycle time</td> </tr> <tr> <td>Strong</td> <td>32 x cycle time</td> </tr> </tbody> </table> | Step | Time constant | None | 1 x cycle time | Weak | 4 x cycle time | Medium | 16 x cycle time | Strong | 32 x cycle time |
| Step | Time constant | | | | | | | | | | |
| None | 1 x cycle time | | | | | | | | | | |
| Weak | 4 x cycle time | | | | | | | | | | |
| Medium | 16 x cycle time | | | | | | | | | | |
| Strong | 32 x cycle time | | | | | | | | | | |

I&M functions

Reading of the I&M data from the module is possible with interface modules as from a higher order number (MLFB) or as from a higher firmware/product version than described in the following table:

| Interface module | Order no. | Firmware version | Product version |
|-------------------------|--------------------|------------------|-----------------|
| IM151-1 HIGH FEATURE | 6ES7151-1BA01-0AB0 | V2.0 | 02 |
| IM151-3 PN | 6ES7151-3AA20-0AB0 | V4.0 | 01 |
| IM151-3 PN HIGH FEATURE | 6ES7151-3BA20-0AB0 | V4.0 | 01 |
| IM151-3 PN FO | 6ES7151-3BB21-0AB0 | V4.0 | 01 |

3.5 2AO U High Feature Analog Electronic Module (6ES7135-4LB02-0AB0)

4.20 2AO U High Feature Analog Electronic Module (6ES7135-4LB02-0AB0)

Properties

- 2 outputs for voltage output
- Output range:
 - ± 5 V, resolution 15 bits + sign
 - ± 10 V, resolution 15 bits + sign
 - 1 V to 5 V, resolution 15 bits
- Isolated from the load voltage L+
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 0.7 ms
 - Minimum conversion time of the output modules: (T_{WAmin}): 0.5 ms
- Supports I&M functions

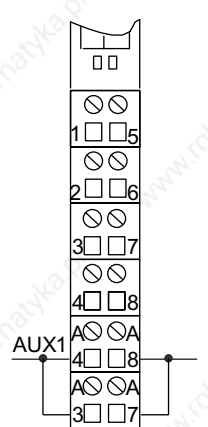
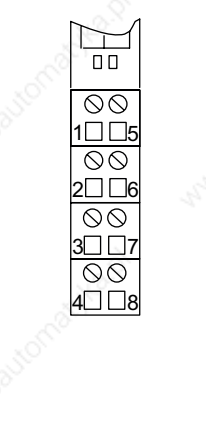
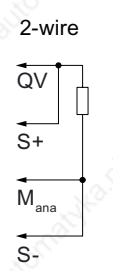
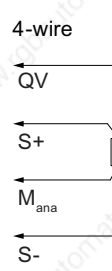
General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AO U High Feature (6ES7135-4LB02-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | QV ₀ | 5 | QV ₁ | <ul style="list-style-type: none"> QV_n: Analog output voltage, channel n S_{n+}: tracer line positive, channel n S_{n-}: tracer line negative, channel n M_{ana}: Ground of the module AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | S ₀₊ | 6 | S ₁₊ | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | S ₀₋ | 8 | S ₁₋ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 2AO U High Feature (6ES7135-4LB02-0AB0) | | |
|---|---|---|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
|  |  | <p style="text-align: center;">Wiring examples</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>2-wire</p>  </div> <div style="text-align: center;"> <p>4-wire</p>  </div> </div> |

Block diagram

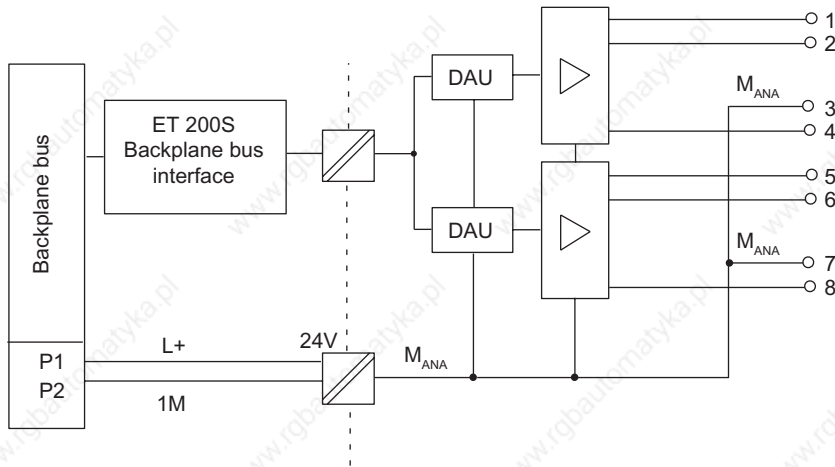


Figure 3-3 Block diagram of the 2AO U High Feature

2AO U High Feature Technical Specifications (6ES7135-4LB02-0AB0)

| Dimensions and weight | |
|--|--------------|
| Dimensions W x H x D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |

| Data for specific modules | |
|--|---|
| Supports isochronous operation | Yes |
| Supports I&M functions | Yes |
| Number of outputs | 2 |
| Cable length | |
| <ul style="list-style-type: none"> Shielded | Max. 200 m Max. 100 m at $T_{WA} < 2$ ms |
| Analog value representation | S5 and S7 format |
| Parameter length | 7 bytes |

| Voltages, currents, potentials | |
|---|--------|
| Rated load voltage L+ (from the power module) | 24 VDC |
| <ul style="list-style-type: none"> Reverse polarity protection | Yes |
| Galvanic isolation | |
| <ul style="list-style-type: none"> Between the channels and backplane bus | Yes |
| <ul style="list-style-type: none"> Between the modules and load voltage L+ | Yes |
| <ul style="list-style-type: none"> Between the channels | No |

New Information About the "ET 200S Distributed I/O System Manual"
3.5 2AO U High Feature Analog Electronic Module (6ES7135-4LB02-0AB0)

| Voltages, currents, potentials | |
|--|-----------------|
| Permissible potential difference | |
| <ul style="list-style-type: none"> Between M_{ANA} and M_{internal} | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| <ul style="list-style-type: none"> From load voltage L+ | Max. 80 mA |
| Power dissipation of the module | Max. 1.2 W |

| Status, interrupts, diagnostics | |
|---|----------------------|
| Diagnostics functions | |
| <ul style="list-style-type: none"> Group error display | Red "SF" LED |
| <ul style="list-style-type: none"> Diagnostic information readable | Yes |
| Substitute values can be applied | Yes, parameterizable |

| Analog value generation | |
|---|---|
| Cycle time per module | 0.5 ms |
| Resolution (including overrange) | ± 5 V / 15 bits + sign ± 10 V / 15 bits + sign 1 V to 5 V / 15 bits |
| Settling time | |
| <ul style="list-style-type: none"> For resistive load | 0.3 ms |
| <ul style="list-style-type: none"> For capacitive load | 0.5 ms |
| <ul style="list-style-type: none"> For inductive load | 0.5 ms |

| Suppression of interference, error limits | |
|--|-------------|
| Crosstalk between the outputs | min. -60 dB |
| Operational limit (in the entire temperature range, with reference to the output range) | ± 0,1 % |
| Basic error limit (operational limit at 25 °C, with reference to the output range) | ± 0,05 % |
| Temperature error (with reference to the output range) | ± 0.003 %/K |
| Linearity error (with reference to the output range) | ± 0,01 % |
| Repeatability (in steady state at 25 °C with reference to output range) | ± 0,01 % |

| Actuator Selection Data | |
|---|--|
| Output range (rated value) | ± 5 V ± 10 V 1 V to 5 V |
| Load impedance (in the rated range of the output) • At voltage outputs capacitive load | Min. 1.0 kΩ Max. 0.5 μF |
| • Voltage output • Short-circuit protection • Short-circuit voltage | Yes Approx. 25 mA |
| Destruction limit against voltages/currents applied from outside | |
| • Voltage at the outputs to M _{ANA} | Max. 15 V continuous; 75 V for max. 1 ms (sampling ratio 1:20) |
| Connection of actuators • Voltage output 2-wire connection 4-wire connection | Possible, without compensation of the line resistances Possible |

I&M functions

Reading of the I&M data from the module is possible with interface modules as from a higher order number (MLFB) or as from a higher firmware/product version than described in the following table:

| Interface module | Order no. | Firmware version | Product version |
|-------------------------|--------------------|------------------|-----------------|
| IM151-1 HIGH FEATURE | 6ES7151-1BA01-0AB0 | V2.0 | 02 |
| IM151-3 PN | 6ES7151-3AA20-0AB0 | V4.0 | 01 |
| IM151-3 PN HIGH FEATURE | 6ES7151-3BA20-0AB0 | V4.0 | 01 |
| IM151-3 PN FO | 6ES7151-3BB21-0AB0 | V4.0 | 01 |

Note

Use of the module after an IM151-7 CPU

If the module is positioned after an IM151-7 CPU, it outputs the last values before a RUN-STOP transition, provided no values were output by the user program after the STOP-RUN transition.

Take this into account when programming the start-up of the control function (OB100 or OB1).

3.6 2AO I High Feature Analog Electronic Module (6ES7135-4MB02-0AB0)

4.22 2AO I High Feature Analog Electronic Module (6ES7135-4MB02-0AB0)

Properties

- 2 outputs for current output
- Output range:
 - ± 20 mA, resolution 15 bits + sign
 - 4 mA to 20 mA, resolution 15 bits
- Isolated from the load voltage L+
- Supports isochronous operation
 - Minimum time for the synchronous DP cycle (T_{DPmin}): 0.7 ms
 - Minimum conversion time of the output modules: (T_{WAmin}): 0.5 ms
- Supports I&M functions

General terminal assignment

Note

Terminals 4, 8, A4, A8, A3 and A7 are only available at specified terminal modules.

| Terminal assignment for 2AO I High Feature (6ES7135-4MB02-0AB0) | | | | |
|---|------------------|----------|------------------|---|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | QI ₀ | 5 | QI ₁ | <ul style="list-style-type: none"> • QI_n: Current analog output, channel n • M_{ana}: Ground of the module • n.c.: Not connected (max. 30 VDC can be connected) • AUX1: Protective-conductor terminal or potential bus (freely usable up to 230 VAC) |
| 2 | n.c. | 6 | n.c. | |
| 3 | M _{ana} | 7 | M _{ana} | |
| 4 | n.c. | 8 | n.c. | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

3.6 2AO I High Feature Analog Electronic Module (6ES7135-4MB02-0AB0)

Usable terminal modules

| Usable terminal modules for 2AO I High Feature (6ES7135-4MB02-0AB0) | | | | |
|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-A1 (6ES7193-4CA30-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | TM-E15C23-01 (6ES7193-4CB10-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-A1 (6ES7193-4CA20-0AA0) | TM-E15S24-01 (6ES 193-4CB20-0AA0) | TM-E15S23-01 (6ES7193-4CB00-0AA0) | ← Screw terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-A1 (6ES7193-4CA70-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | TM-E15N23-01 (6ES7193-4CB60-0AA0) | ← Fast Connect |
| | | | | <p>Sample connection</p> |

Block diagram

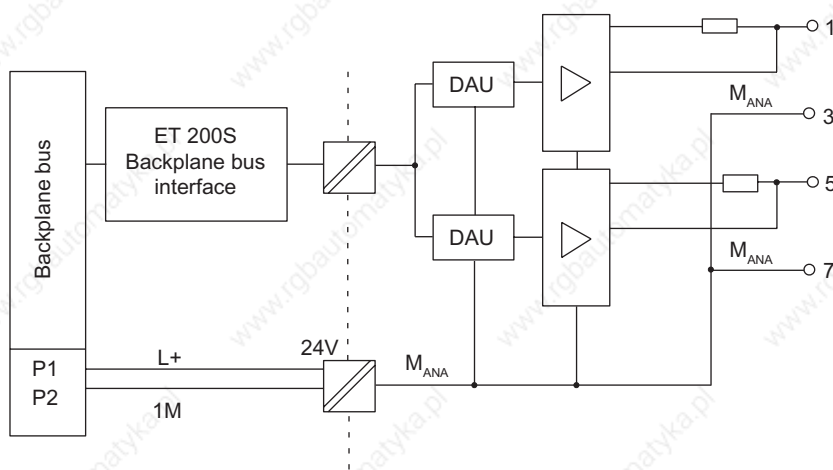


Figure 3-4 Block diagram of the 2AO I High Feature

2AO I High Feature Technical Specifications (6ES7135-4MB02-0AB0)

| Dimensions and weight | |
|--|--------------|
| Dimensions W x H x D (mm) (the total dimensions depend on the selected terminal module) | 15 x 81 x 52 |
| Weight | Approx. 40 g |

| Data for specific modules | |
|--|---|
| Supports isochronous operation | Yes |
| Supports I&M functions | Yes |
| Number of outputs | 2 |
| Cable length | |
| <ul style="list-style-type: none"> • Shielded | Max. 200 m Max. 100 m at $T_{WA} < 2$ ms |
| Parameter length | 7 bytes |
| Analog value representation | S5 and S7 format |

| Voltages, currents, potentials | |
|--|-----------------|
| Rated supply voltage of the electronics L+ | 24 VDC |
| <ul style="list-style-type: none"> • Reverse polarity protection | Yes |
| Galvanic isolation | |
| <ul style="list-style-type: none"> • Between the channels and backplane bus | Yes |
| <ul style="list-style-type: none"> • Between modules and power supply of the electronics | Yes |
| <ul style="list-style-type: none"> • Between the channels | No |
| Permissible potential difference | |
| <ul style="list-style-type: none"> • Between M_{ANA} and $M_{internal}$ | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | Max. 80 mA |
| <ul style="list-style-type: none"> • From the power supply L+ | |
| Power dissipation of the module | Max. 1.2 W |

| Status, interrupts, diagnostics | |
|---|-----------------------------------|
| Diagnostics functions | |
| <ul style="list-style-type: none"> • Group error display | Red "SF" LED |
| <ul style="list-style-type: none"> • Diagnostic information readable | Yes |
| <ul style="list-style-type: none"> • Wire break diagnostics | Yes, at input range 4 mA to 20 mA |
| Substitute values can be applied | Yes, parameterizable |

| Analog value generation | |
|---|---|
| Resolution (including overrange) | ± 20 mA / 15 bits + sign 4 mA to 20 mA / 15 bits |
| Cycle time (per module) | Max. 0.5 ms |
| Settling time | |
| <ul style="list-style-type: none"> For resistive load | 0.3 ms |
| <ul style="list-style-type: none"> For capacitive load | 1.0 ms |
| <ul style="list-style-type: none"> For inductive load | 0.5 ms |

| Suppression of interference, error limits | |
|---|-----------------------------------|
| Crosstalk between the outputs | < - 60 dB |
| Operational limit (in the entire temperature range, with reference to the output range) | $\pm 0,1$ % |
| Basic error limit (operational limit at 25 °C, with reference to the output range) | $\pm 0,05$ % |
| Temperature error (with reference to the output range) | ± 0.003 %/K |
| Linearity error (with reference to the output range) | $\pm 0.01\%$ (for resistive load) |
| Repeatability (in steady state at 25 °C with reference to output range) | $\pm 0,01$ % |

| Measuring Transducer Selection Data | |
|---|--|
| Output range (rated value) | ± 20 mA 4 to 20 mA |
| Load impedance (in the rated range of the output) | |
| <ul style="list-style-type: none"> For current outputs For inductive load | Max. 500 Ω 1 mH |
| Current output | |
| <ul style="list-style-type: none"> Open circuit voltage | 18 V |
| Destruction limit against voltages/currents applied from outside | |
| <ul style="list-style-type: none"> Voltage at the outputs to M_{ANA} | Max. 15 V continuous; 75 V for max. 1 ms (sampling ratio 1:20) |
| <ul style="list-style-type: none"> Current | Max. 50 mA DC |
| Connection of actuators | |
| <ul style="list-style-type: none"> Current output two-wire connection | Yes |

I&M functions

Reading of the I&M data from the module is possible with interface modules as from a higher order number (MLFB) or as from a higher firmware/product version than described in the following table:

| Interface module | Order no. | Firmware version | Product version |
|-------------------------|--------------------|------------------|-----------------|
| IM151-1 HIGH FEATURE | 6ES7151-1BA01-0AB0 | V2.0 | 02 |
| IM151-3 PN | 6ES7151-3AA20-0AB0 | V4.0 | 01 |
| IM151-3 PN HIGH FEATURE | 6ES7151-3BA20-0AB0 | V4.0 | 01 |
| IM151-3 PN FO | 6ES7151-3BB21-0AB0 | V4.0 | 01 |

Note

Use of the module after an IM151-7 CPU

If the module is positioned after an IM151-7 CPU, it outputs the last values before a RUN-STOP transition, provided no values were output by the user program after the STOP-RUN transition.

Take this into account when programming the start-up of the control function (OB100 or OB1).

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Introduction

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SIMATIC

Distributed I/O System ET 200S

Product Information

09/2006

A5E00847859-01

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.



Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.



Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.



Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:



Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by © are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 Introduction

This product information describes supplements to the *ET 200S Distributed I/O System Operating Instructions* (A5E00515771-03), release 12/2005 and to the *ET 200S Distributed I/O System Manual* (A5E00514527-03), release 12/2005.

The chapter number mentioned in this product information refer to the chapters in the ET 200S Distributed I/O System Operating Instructions (A5E00515771-03), release 12/2005 and to the ET 200S Distributed I/O System Manual (A5E00514527-03), release 12/2005.

Contents of this Product Information

The product spectrum of the ET 200S is supplemented by the 8-channel digital electronic modules 8DI DC24V and 8DO DC24V 0.5A.

| Section | Contents of this Product Information | Manual |
|---------|---|---|
| 2.1 | Interrupt, error and system messages at 8DI / 8DO | Supplements Chapter 8 of the operating instructions |
| 2.2 | Digital electronic module 8DI DC24V | Supplements Chapter 3 in the manual |
| 2.3 | Digital electronic module 8 DO DC 24V/0.5A | |

Prerequisites for Operating the Digital Electronic Modules with the Interface Modules

Operation of the digital electronic modules 8DI DC24V/ 8DO DC24V 0.5A is possible with the following interface modules from the specified order numbers (or firmware version). There are no limitations at the interface modules listed in the table.

| Interface module | As of Order Number | As of Firmware Version |
|--------------------------|--------------------|------------------------|
| IM 151-1 STANDARD | 6ES7151-1AA03-0AB0 | --- |
| IM 151-1 FO STANDARD | 6ES7151-1AB02-0AB0 | --- |
| IM 151-1 HIGH FEATURE | 6ES7151-1BA01-0AB0 | V2.1.3 |
| IM 151-3 PN | 6ES7151-3AA20-0AB0 | V4.0.1 |
| IM 151-3 PN HIGH FEATURE | 6ES7151-3BA20-0AB0 | |
| IM 151-3 PN FO | 6ES7151-3BB21-0AB0 | |

Introduction

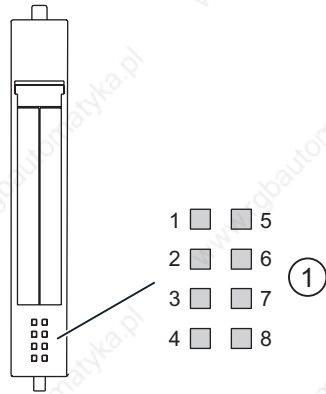
1.1 Introduction

Product Information

2.1 Interrupt, Error and System Messages at 8DI / 8DO

Digital electronic modules 8DI DC24V, 8DO DC24V 0.5A

LED display at 8DI DC24V, 8DO DC24V 0.5A:



① Status display for input/output status (green)

Status and error displays by means of LEDs at 8DI DC24V, 8DO DC24V 0.5A

The table below shows the status and error displays at the digital electronic modules.

| Event (LEDs) | | | | | | | | Cause | Remedy |
|--------------|----|----|----|----|----|----|----|-----------------------------------|--------|
| 1 | 5 | 2 | 6 | 3 | 7 | 4 | 8 | | |
| On | | | | | | | | Input/output on channel 0 active. | --- |
| | On | | | | | | | Input/output on channel 1 active. | --- |
| | | On | | | | | | Input/output at Channel 2 active. | --- |
| | | | On | | | | | Input/output at Channel 3 active. | --- |
| | | | | On | | | | Input/output at Channel 4 active. | --- |
| | | | | | On | | | Input/output at Channel 5 active. | --- |
| | | | | | | On | | Input/output at Channel 6 active. | --- |
| | | | | | | | On | Input/output at Channel 7 active. | --- |

2.2 Digital Electronic Module 8DI DC24V (6ES7131-4BF00-0AA0)

Properties

- Digital electronic module with eight inputs
- Nominal input voltage 24 VDC
- Suitable for connecting 2-wire sensors
- Isochronous mode supported

General terminal assignment

Note

Terminals A4, A8, A3 and A7 are only available at specified terminal modules.

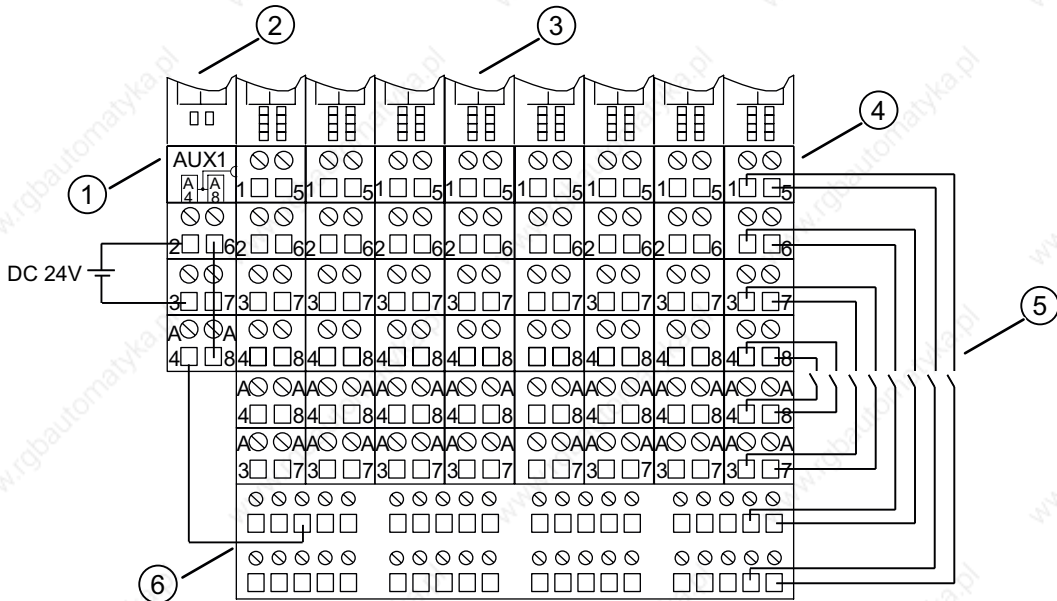
| Pin assignment for 8DI DC24V (6ES7131-4BF00-0AA0) | | | | |
|---|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DI ₀ | 5 | DI ₁ | <ul style="list-style-type: none">• DI_n: Input signal, Channel n• AUX1: Sensor power supply 24 VDC (for example from power module) or potential bus (can be used freely up to 230 VAC) |
| 2 | DI ₂ | 6 | DI ₃ | |
| 3 | DI ₄ | 7 | DI ₅ | |
| 4 | DI ₆ | 8 | DI ₇ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable terminal modules

| Usable terminal modules for 8DI DC24V (6ES7131-4BF00-0AA0) | | |
|--|--------------------------------------|--------------------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | <p>Wiring examples</p> <p>1-wire</p> |

2-wire connection

The following configuration example shows a 2-wire connection with the electronic modules 8DI DC24V. You require further terminals so that sufficient terminals are available for the 24 VDC sensor power supply when the TM-E15S26-A1 terminal modules are used. In the example this is implemented by the add-on terminal TE-U120S4x10. Per add-on terminal, terminal modules of the same height must exist across a minimum width of 120 mm. You can naturally also use other terminals for this configuration (for example, ET 200S potential distribution module 4POTDIS).



- ① Terminal module TM-P15S23-A0
- ② Power module PM-E 24 VDC
- ③ Electronic modules 8DI DC24V
- ④ Terminal modules TM-E15S26-A1
- ⑤ Sensor in 2-wire connection
- ⑥ Add-on terminal TE-U120S4x10

Block Diagram

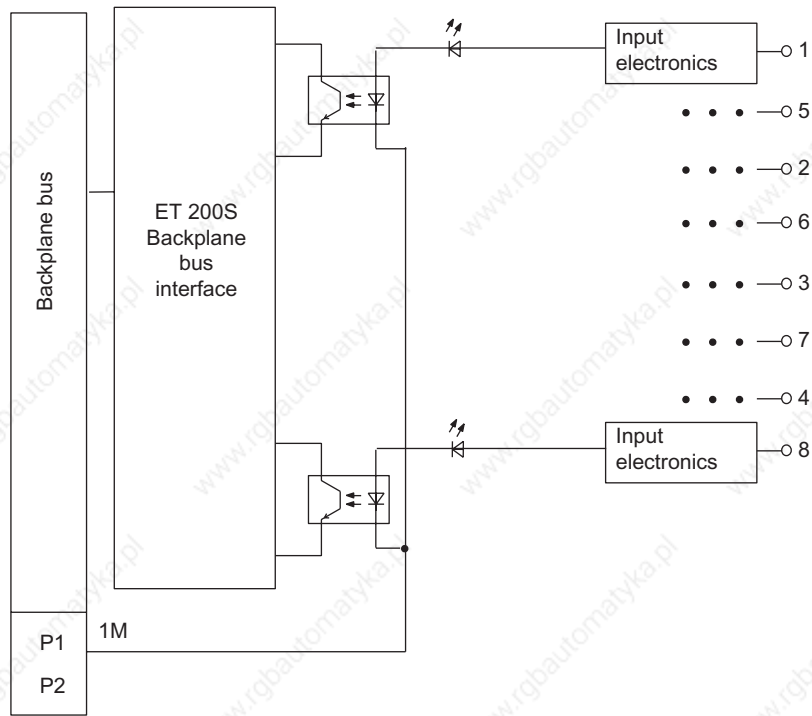


Figure 2-1 Block diagram of the 8DI DC24V

Technical Specifications 8DI DC24V (6ES7131-4BF00-0AA0)

| Dimensions and weight | |
|--|--------------------------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 35 g |
| Module-specific data | |
| Supports isochronous operation | Yes |
| Number of inputs | 8 |
| Length of cable | |
| • Unshielded | 600 m, maximum |
| • Shielded | 1000 m, maximum |
| Parameter length | 3 bytes |
| Voltages, currents, potentials | |
| Rated supply voltage (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes |
| Electrical isolation | |
| • Between the channels | No |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation test voltage | 500 VDC |
| Current consumption | |
| • From supply voltage | Dependent on the sensor |
| Power dissipation of the module | Typically 1.2 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | No |
| Data for selecting a sensor | |
| Input voltage | |
| • Rated value | 24 VDC |
| • For signal "1" | 15 V to 30 V |
| • For signal "0" | -30 V to 5 V |
| Input current | |
| • At signal "1" | Typ. 7 mA (for 24 V) |
| Input delay | |
| • At "0" to "1" | Typ. 3 ms (2.0 to 4.5 ms) |
| • At "1" to "0" | Typ. 3 ms (2.0 to 4.5 ms) |
| Input characteristic curve | According to IEC 61131, Type 1 |
| Connection of 2-wire BEROs | Supported |
| • Permitted bias current | Max. 1.5 mA |

2.3 Digital Electronic Module 8DO DC24V/0.5A (6ES7132-4BF00-0AA0)

Properties

- Digital electronic module with eight outputs
- Output current 0.5 A per output, aggregate current 4 A
- Rated load voltage 24 VDC
- Short-circuit protection
- Suitable for solenoid valves, DC contactors, and indicator lights
- Isochronous mode supported

General terminal assignment

Note

Terminals A4, A8, A3 and A7 are only available at specified terminal modules.

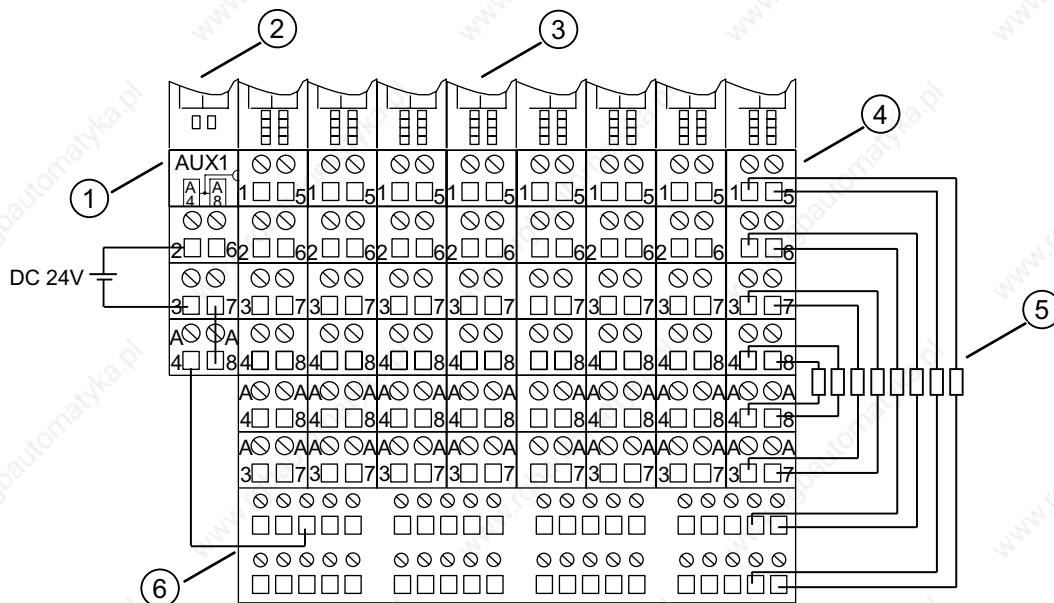
| Pin assignment for 8DO DC24V/0.5A (6ES7132-4BF00-0AA0) | | | | |
|--|-----------------|----------|-----------------|--|
| Terminal | Assignment | Terminal | Assignment | Notes |
| 1 | DO ₀ | 5 | DO ₁ | <ul style="list-style-type: none"> • DO_n: Input signal, Channel n • AUX1: M chassis ground (from power module) or potential bus (freely usable up to 230 VAC) |
| 2 | DO ₂ | 6 | DO ₃ | |
| 3 | DO ₄ | 7 | DO ₅ | |
| 4 | DO ₆ | 8 | DO ₇ | |
| A4 | AUX1 | A8 | AUX1 | |
| A3 | AUX1 | A7 | AUX1 | |

Usable Terminal Modules

| Usable terminal modules for 8DO DC24V/0.5A (6ES7132-4BF00-0AA0) | | |
|---|--------------------------------------|------------------------|
| TM-E15C26-A1 (6ES7193-4CA50-0AA0) | TM-E15C24-01 (6ES7193-4CB30-0AA0) | ← Spring terminal |
| TM-E15S26-A1 (6ES7193-4CA40-0AA0) | TM-E15S24-01 (6ES7193-4CB20-0AA0) | ← Screw-type terminal |
| TM-E15N26-A1 (6ES7193-4CA80-0AA0) | TM-E15N24-01 (6ES7193-4CB70-0AA0) | ← Fast Connect |
| | | <p>Wiring examples</p> |

2-wire connection

The following configuration example shows a 2-wire connection with the electronic modules 8DO DC24V. You require further terminals so that sufficient terminals are available for the chassis ground connection M when the TM-E15S26-A1 terminal modules are used. In the example this is implemented by the add-on terminal TE-U120S4x10 that can be mounted as from a width of 120 mm (8 EMs). You can naturally also use other terminals for this configuration (for example, ET 200S potential distribution module 4POTDIS).



- ① Terminal module TM-P15S23-A0
- ② Power module PM-E 24 VDC
- ③ Electronic modules 8DI DC24V
- ④ Terminal modules TM-E15S26-A1
- ⑤ Actuators in 2-wire connection
- ⑥ Add-on terminal TE-U120S4x10

Block Diagram

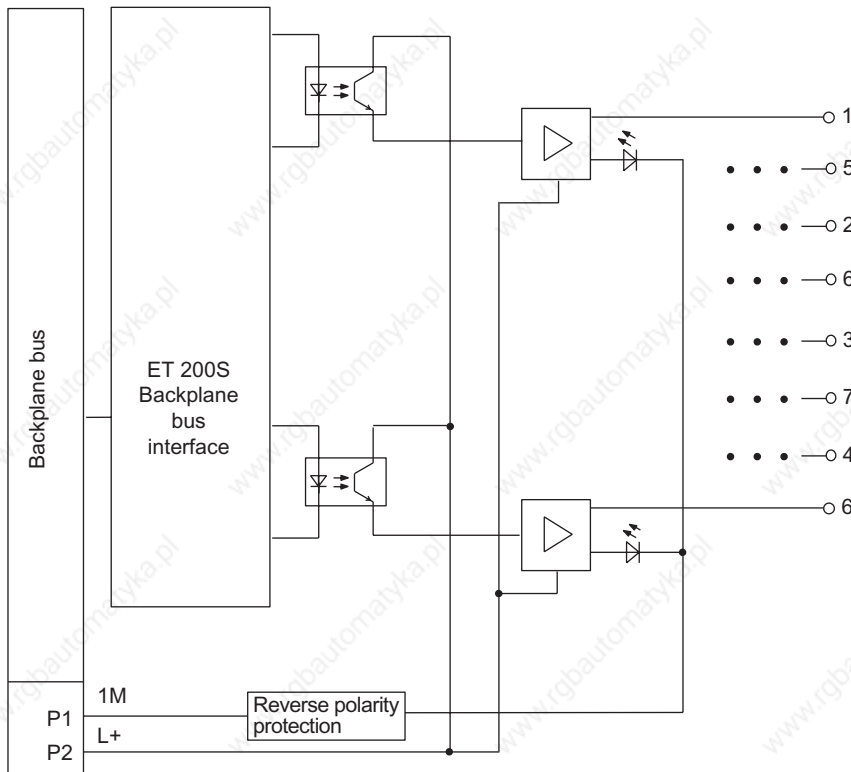


Figure 2-2 Block diagram of the 8 DO DC 24V/0.5A

Technical specifications 8DO DC24V/0.5A (6ES7132-4BF00-0AA0)

| Dimensions and weight | |
|--|-----------------|
| Dimensions W × H × D (mm) (the total dimensions depend on the selected terminal module) | 15 × 81 × 52 |
| Weight | Approx. 40 g |
| Module-specific data | |
| Supports isochronous operation | Yes |
| Number of outputs | 8 |
| Length of cable | |
| • Unshielded | 600 m, maximum |
| • Shielded | 1000 m, maximum |
| Parameter length | 3 bytes |

2.3 Digital Electronic Module 8DO DC24V/0.5A (6ES7132-4BF00-0AA0)

| Voltages, currents, potentials | |
|---|--|
| Rated load voltage L+ (from the power module) | 24 VDC |
| • Reverse polarity protection | Yes ¹ |
| Total current of the outputs (per module) | 4 A |
| Electrical isolation | |
| • Between the channels | No |
| • Between the channels and backplane bus | Yes |
| Permissible potential difference | |
| • Between the different circuits | 75 VDC / 60 VAC |
| Insulation tested | 500 VDC |
| Current consumption | |
| • From the rated load voltage L+ (no load) | Max. 5 mA per channel |
| Power dissipation of the module | Typically 1.5 W |
| Status, interrupts, diagnostics | |
| Status display | Green LED per channel |
| Diagnostics function | No |
| Data for selecting an actuator | |
| Output voltage | |
| • At signal "1" | Min. L+ (-1 V) |
| Output current | |
| • At signal "1" | |
| – Rated value | 0.5 A |
| – Permitted range | 7 mA to 0.6 A |
| • With signal "0" (leakage current) | 0.3 mA max. |
| Output delay (for resistive load) | |
| • At "0" to "1" | max. 300 µs |
| • At "1" to "0" | max. 600 µs |
| Load resistor range | 48 Ω to 3.4 kΩ |
| Lamp load | Max. 5 W |
| Connecting two outputs in parallel | |
| • For redundant triggering of a load | Yes (per module) |
| • To increase performance | No |
| Control of a digital input | Yes |
| Switch rate | |
| • For resistive load | 100 Hz |
| • On inductive load | 2 Hz |
| • For lamp load | 10 Hz |
| Limitation (internal) of the voltage induced on circuit interruption | Typically L+ (-55 V to -60 V) |
| Reverse-voltage proof | Yes, if using the same load voltage as at the power module |
| Short-circuit protection of the output | Yes ² |
| • Threshold on | Typically 1.5 A |
| ¹ Polarity reversal can lead to the digital outputs being connected through. | |
| ² Per channel | |

Product Information

2.3 Digital Electronic Module 8DO DC24V/0.5A (6ES7132-4BF00-0AA0)

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Product Information

04/2006

ET 200S Distributed I/O System

We are sorry to inform you that on **pages 4-93 to 4-97** the title is wrong and should be **"2AI TC High Feature analog electronic module (6ES7134-4NB01-0AB0)"**.

In the next edition the title will be corrected.

We hope to find your understanding.

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Product Information on Manual

Distributed I/O system ET 200S, Edition 12/2005

This product information contains important information on the manual mentioned above. It is a separate component and should be considered more up-to-date than the information in the manuals and catalogs if uncertainties arise.

Chapter 2: Supplement to the technical specifications PM-E DC 24-48V/AC24..230V (6ES7138-4CB11-0AB0)

The technical specifications have been supplemented for vertical and horizontal mounting:

| Voltages, currents, potentials | |
|--|--|
| Max. current-carrying capacity | 10 A |
| <ul style="list-style-type: none">for 24 VDC to 56.7VDC<ul style="list-style-type: none">– up to 30 °C– up to 40 °C– up to 60 °C | horizontal mounting max. 10 A max. 9 A max. 7 A |
| <ul style="list-style-type: none">for 24 VDC to 56.7VDC<ul style="list-style-type: none">– up to 40 °C | vertical mounting max. 7 A |
| <ul style="list-style-type: none">for 24 VAC to 48/120/230VAC<ul style="list-style-type: none">– up to 30 °C– up to 40 °C– up to 60 °C | horizontal mounting max. 8 A max. 7 A max. 5 A |
| <ul style="list-style-type: none">for 24VAC to 48/120/230VAC<ul style="list-style-type: none">– up to 40 °C | vertical mounting max. 5 A |

